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ADDRESSES.

WATERBORNE CHOLERA.

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Mr. President and Members of the American Medical Association:—The thesis which I am here to present to you is one which has a superficial air of triteness, but it is not our value to be affected by superficialities, and I hope to convince you that although well worn, the subject of the causation and prevalation of cholera is by no means threadbare. At any rate, to such threads of this well worn subject as have survived attrition, there lie attached untold thousands of lives, which it may be yours or mine at any moment to save. My thesis is that cholera death is a violent death, an unnatural death, a preventable death; that the very existence of epidemic cholera, not to say endemic cholera, is a reproach to the nation and to the community in which it exists. Being a violent death, its prevalence is due to ignorance or apathy, which, from the dimensions of a blunder, easily develop into the proportions of a gigantic crime. Cholera deaths can be prevented, ought to be prevented; and, as I firmly believe, have been largely diminished by agencies to which medical men have pointed and will, in our lifetime, and therefore before long, be so wholly prevented that Asiatic cholera like the Asiatic plague, the bubonic pest and their more modern correlative, typhus fever, will become extinct among European nations, and survive only among the records and relics of an historic shame. You will perhaps hardly be surprised, even although you may not yet be prepared to accept my view of the facts, if I begin by saying to you what I hope to end by proving, that epidemic cholera can only be diffused where the water supplies of the community are poisoned with a specific poison, which we had recently identified as the cholera bacillus. That identification I believe to be correct, but the correctness of it is not necessarily associated with the true interpretation of the historical facts of the case. It, however, concurs with them. The independent evidence which it supplies, strengthens our appreciation of clinical records of cholera infections and cholera outbreaks, in the past and the present. But its more or less of error or incompleteness, if such there be, does not prevent our correctly interpreting the epidemic and clinical histories which are inscribed upon the scrolls of cholera literature.

There still survive some of the old notions which half a century ago—indeed much more recently—attributed cholera to the operation of "telluric" and "meteoric" influences, "atmospheric" and "pandemic" waves, "cholera blasts," and other mysterious agencies, are happily now becoming things of the past, though eminent writers are still to be found who discuss the spread of cholera from the point of view of some "general influence" or "choleraic influence," to the obscuring of other agencies which the overwhelming evidence of past epidemics has shown to be of superior and more practical importance. Even as recently as the great Russian epidemic of 1892, a clever English, though happily non-medical, writer (Hall Caine), referred to "the cholera insect which flies across the frontier," and I have been gravely apprised from one or two quarters of "blue mists," and "plagues of flies," such as were observed during previous cholera epidemics.

Ideas of this sort may, perhaps, be pardonable among such unenlightened communities as last year destroyed the cholera hospitals hastily provided at Astrakhan and Saratoff to receive the victims of the advancing scourge, and cruelly maltreated the doctors who, in the midst of superstition and filth were battling with its subtleties. But it is desirable to put aside these theories, or leave them for academic discussion, and to deal with the spread of cholera practically in the light of the accumulated evidence afforded by all the great epidemics of the past. That accumulated, and unhappily still accumulating, evidence clearly shows that cholera is a filth disease carried by dirty people to dirty places, and there spread by dirt and the use of dirty water. It is well to take every means of impressing this fact on the popular mind, and to use it as a powerful lever to push forward the war against filth already so well begun. We should aim at security purity of our water, our air, our soil, and our habits. This achieved, cholera need no longer be feared. But it is a herculean task, and must in many countries, where filth, so to speak, is endemic, be slow of accomplishment. Even in our own country, the Augean stables requiring to be cleansed are still far too numerous. There are still far too many villagers and even townspeople throughout England who are more than satisfied with the polluted wells which have served their ancestors without bringing them to a premature grave. Water supplies are still too frequently obtained from contaminated rivers, and filth nuisances of every description are still too common amongst us. But to cherish and seriously discuss theories respecting "cholera influences," "epidemic waves," and so forth, is to retard the work of sanitary reform, and render it more difficult of successful and speedy accomplishment.

Ever since Snow in 1849, with the shrewdness of genius and the confidence of conviction, propounded his belief that the consumption of polluted water had had a great deal to do with the spread of cholera in England, each succeeding epidemic in this country and elsewhere has furnished overwhelming evi-

dence of its truth. For my own part, the deductions of Snow, confirmed as they were by the elaborate investigations of Farr and Simon, were always conclusive; but since 1866, when I was personally instrumental in tracing the disastrous cholera epidemic of that year in East London to the distribution of unfiltered and polluted water from the Lee during several days by the East London Water Company, I have been convinced that specifically polluted water is not merely an occasional or adjuvant cause, but the *causa causans* of almost every great epidemic of Asiatic cholera. Further, when the use of the poisoned water has been abandoned or cut off, the epidemic has ceased.

I have closely watched each successive disastrous cholera outbreak which has occurred within the last thirty years, and the facts have practically without exception, clearly borne out this contention, and strengthened my robust faith in it. The neglect of prompt and complete investigation of the whole circumstances of many of the foreign epidemics have rendered it impossible in some cases to learn all the facts; but where full investigations of the facts have been made by competent inquiries, the result has in almost every instance been remarkable in the confirmation afforded of the diffusion of cholera by water.

(A) ENGLISH EXPERIENCES.—EPIDEMIC OF 1831-33.

In England, cholera first appeared in October, 1831, and between that time and the summer of 1833, it ruthlessly ravaged various parts of the kingdom. No accurate history of the epidemic exists, and there are no reliable statistics respecting it, as the present system of registering the causes of death had not then been established. But in places in Great Britain having an aggregate population of less than 5,250,000, the deaths of 31,376 persons, and in Ireland of 21,171 persons, were reported through various channels to the board of health. In London alone, which then contained a population of little more than 1,500,000 there were 13,144 cholera attacks, and 6,729 deaths during eighteen months; that is to say, one person out of every 117 was attacked by the disease, whilst one in every 250 died. The epidemic filled the people with consternation, and took the medical profession by surprise. Its characteristics were unfamiliar and unaccountable, and its extension was so sudden and mysterious that it was popularly looked upon as a visitation of Providence beyond human control. According to the *Annual Register* of 1832, "the cholera left medical men as it had found them—confirmed in most opposite views, or in total ignorance as to its nature, its cure, and the causes of its origin, if endemic, or the mode of transmission if it were infectious." This, perhaps, is rather a severe criticism; for although all that we now know of its habits had not then become clear, the new disease was carefully studied, and much was learned of its characteristics. A consultative board of health was established, and the privy council circulated rules and regulations which, though far from complete, contained much sound advice. It was pointed out that the disease had special affinity for the poor, ill fed, unhealthy parts of the population, especially those of drunken, irregular life, and those districts which were unclean, ill-ventilated and crowded. General cleanliness was enjoined, the provision of special hospitals was advised, and strict quarantine was sought to be enforced. But the most active medium of its epidemic extension—namely, water—seems to have received little thought. Whether water played a conspicuous part in the 1832 epidemic can not be proved to demonstration, as attention was not then directed to that phase of the subject. But the general circumstances of the water supplies of the country were such as to favor the diffusion of cholera once introduced; and incidents collected a few years later by Dr. Snow[1] respecting the distribution of the disease in 1832 in London, Newburn, Newcastle, Nottingham, Exeter, and elsewhere, lead to the presumption that, as in subsequent epidemics, contaminated water played its part.

The sanitary condition of these islands at that period was very different from what it is at the present day. Unprotected wells, leaky cesspools, and filth nuisances of every description abounded, for the age of sanitary reform had not then commenced.

THE EPIDEMIC OF 1848-9.

The epidemic of 1832 set men thinking, and gave a great impetus to sanitary reform. Before the next great invasion of this country by cholera in 1848, a growing tendency towards improvement in sanitation was distinctly noticeable. In September, 1848, cases of cholera occurred in Hull, and were soon followed by outbreaks at Edinburgh, Leith, Sunderland and elsewhere. It rapidly overran the whole country, and before it had disappeared in epidemic form towards the close of 1849, 53,293 of the English people had died from it, and 18,887 had died from diarrhœa, out of a population of some 17,564,656 living in a great variety of circumstances. It was in August, 1849, whilst this epidemic was running its course, that Snow[2] cast a strong light on the spread of cholera by propounding his theory that a most important way in which the disease may be widely disseminated is "by the emptying of sewers into the drinking water of the community." As far as his inquiries had extended he had found that in most towns in which the malady had prevailed to an unusual extent this means of its communication had existed. He pointed out for instance, that the joint town of Dumfries and Maxwellton, not usually an unhealthy place, had been visited by cholera both in 1832 and at the close of 1848 with extreme severity. On the latter occasion the deaths were 317 in Dumfries, and 114 in Maxwelltown, being 431 in a population of 14,000. The inhabitants drank the water of the Nith, a river into which the sewers emptied themselves, the contents floating afterwards to and fro with the tide. Glasgow, which had been visited severely with the malady, was supplied with water from the Clyde, by means of an establishment situated a little way from the town higher up the stream, and the water was professedly filtered; but, as the Clyde is a tidal river in that part of its course, the contents of the sewers would be washed up the stream and the supply of water could not be altogether free from contamination. Again, he pointed out that in 1832 the cholera was much more prevalent in the south and east districts of London, which were supplied with water from the Thames and the Lee where those rivers were much contaminated by

[1] On the Mode of Communication of Cholera. By John Snow, M.D. 1854.

[2] Pamphlet dated August 29, 2849, On the Mode of Communication of Cholera. By John Snow, M.D.

the sewers, than in the other parts of the metropolis differently supplied. And this he observed was precisely what again occurred in 1849. It may here be mentioned that in 1849, and for a few years later, none of the London water companies obtained their water higher up the Thames than Vauxhall bridge, above which point the river received an ever increasing amount of sewage.

But apart from the water companies, there were a great many pumps supplied by wells in use in the metropolis. On investigating a sudden and severe outbreak of cholera in Surrey Buildings, Horsleydown, Dr. Snow found that a certain well in use by the patients had been exposed to direct pollution by the dejections of earlier patients. A very similar state of affairs was found at Albion Terrace, Wandsworth Road, where a number of cholera cases occurred almost simultaneously. In that instance there was no data for showing how the disease was probably communicated to the first patients, "but it was two or three days afterwards, when the evacuations from these patients must have entered the drains having a communication with the water supplied to all the houses, that other persons were attacked, and in two days more the disease prevailed to an alarming extent." This explanation of the outbreak was disputed at the time, but Dr. Snow pointed out that "the only special and peculiar cause connected with the great calamity which befell the inhabitants of these houses was the state of the water, which was followed by the cholera in almost every house to which it extended, whilst all the surrounding houses were quite free from the disease."

His theory of the whole epidemic of 1848–9 was that the cholera matter was brought to London by patients from Hamburg, that it was multiplied by infected persons, that the infectious sewage matter found its way partly through soil into the wells, and partly through sewers into the Thames and Lee, from which a portion of the water supply of London was derived. This theory was adversely criticised in a report by Drs. Baly and Gull to the London College of Physicians in 1850; and, as Mr. N. C. McNamara has well remarked in his valuable Treatise on Asiatic Cholera, "these physicians well-nigh nipped this doctrine in the bud; had there been less truth in it than there is, their unqualified and positive condemnation of this theory would have utterly crushed it. As it is, their opinions have done much to retard the progress of our knowledge of the etiology of cholera."

EPIDEMIC OF 1853–54—THE BROAD STREET PUMP.

Dr. Snow had not long to wait for an opportunity of putting his theory to the test. In the early part of the summer of 1854 cholera had obtained a foothold in London. One special outbreak which occurred in the parish of St. James, Westminster, during that epidemic, is almost of historic importance, as it was the first instance in which the agency of water as a disseminator of cholera was clearly demonstrated. The outbreak was a good illustration of what occurred all over this country during the earlier cholera epidemics, and of what I regret to say occurs at the present day in India and elsewhere. The first death in the parish was recorded early in August, and throughout that month a few deaths were recorded each week. But during the week ending September 2, seventy-eight deaths were registered; in the next week there were 287 deaths, in the following week there were sixty-seven, and then the mortality as quickly subsided as it had risen. But before it had disappeared at the beginning of November, some 700 fatal attacks had occurred in this single parish; that is to say, twenty-two out of every 1,000 persons living in the parish had died of the disease within three months. In the excitement of the moment various causes were assigned for this mysterious and sudden outburst. Some accused the ancient pest field in the parish, where during the Great Plague the dead had been buried by the hundred, of casting forth the disease germs buried there nearly 200 years previously. Others laid the blame on the unflushed and defectively ventilated sewers; whilst others again found sufficient cause in the extreme heat of the weather. But no satisfactory solution of the mystery presented itself until Dr. Snow was called in to examine the water supplies.

On studying the record of the deaths, Dr. Snow found that nearly all of those registered in the first week of the outbreak had taken place within a short distance of the parish pump in Broad street; and that of seventy-three deaths in the locality around this pump, sixty-one were found to have been of persons who used to drink the water from that particular pump. Pursuing his inquiries, he found that in a factory in the neighborhood, where the water was always used, eighteen out of the 200 workpeople died. On the other hand, in an adjoining brewery in Broad street, where water from that pump was never used, not one of the seventy workmen employed suffered from the disease. In another case a gentleman came from Brighton to see his brother, who was attacked by cholera in a house near the pump. On his arrival he found his brother dead, but he did not see the body. He remained only twenty minutes in the house, and after partaking of a hasty lunch, including some brandy and water (the water being from the Broad street pump), he proceeded to Pentonville, where he was attacked by cholera during the following day, and was dead within twenty-four hours. In another case, a lady living at Hampstead was in the habit of having brought to her daily a large bottle of water from the Broad street pump, as she had a preference for it, the water being both cool and sparkling, as sewage polluted water often is. The water was taken to her as usual on August 31; she drank of it, was seized with cholera on the next day, and died within twenty-four hours. A niece who was on a visit to this lady also drank of the water, returned to her residence in a high healthy part of Islington, was attacked with cholera and died also. In all these cases the water was used cold and unboiled. Had it been boiled before use its peculiarly sparkling character, which constituted its attractiveness, might have been sacrificed, but its dangerous properties would have been destroyed. Many dismal incidents such as these were discovered both by Dr. Snow and by the Rev. Mr. Whitehead, who conducted an independent investigation and showed the complicity of this well water with the outbreak. On following up the clue it was found that the pump immediately adjoined the house, No. 40 Broad street, and on the drains of that house being opened, a filthy condition of things was disclosed. There was a cesspool under a common privy, within three feet of the well and at a higher level than that of the water in the well. The walls of the cesspool were rotten, and the contents could leak into the surrounding soil. The walls of the

well were also found to be rotten, and there was distinct evidence of the cesspool contents having for a long time leaked into the well. Further investigation also disclosed the fact that on August 28 a child aged five months, living in this house, was attacked with what was registered as diarrhœa, and died on September 2. The symptoms of this child's illness, however, were distinctly choleraic.

This ghastly experiment fortunately bore good fruit. The more practical of our sanitarians realized its bearings, and the purity and protection of our water supplies received more attention. The first step was the abolition in the metropolis of such dangerous shallow wells as that in Broad street; wells which, in the words of Sir John Simon, contained evidence that "they represented the drainage of a great manure bed."

But the water companies also needed much reform, for it was now evident that they had unconsciously been trying gigantic experiments with the lives of Londoners. In 1856 Mr.—now Sir John—Simon, who was at different times a member of the committee for scientific purposes appointed to investigate the nature and circumstances of the cholera epidemics, medical adviser to the general board of health, and medical officer of the privy council, had in his reports described very fully the relations of the water supplied by the London water companies with the epidemics of cholera. He showed in 1856 that as often as Asiatic cholera had been epidemic in London it had been observed to prevail with especial severity in certain localities on the south side of the Thames —in St. Saviour's, St. Olave's and St. George's, Southwark, and in Bermondsey, Newington, Lambeth, Wandsworth, Camberwell and Rotherhithe.

The water supply of these districts was divided between two companies—the Lambeth and the Southwark and Vauxhall. In 1853 the former company drew their water from the Thames at Thames Ditton, having recently, in conformity with the requirements of the metropolis water act of 1852, moved their intake from Hungerford bridge; the latter company, however, still drew their supply from the Thames at Battersea. The former company, pumping from the higher and cleaner part of the river, furnished as good a water as any then distributed in London; while the latter, pumping from Battersea, was purveying perhaps the filthiest stuff ever drunk by a civilized community.

Microscopical and chemical observations proved the almost incredible foulness of the water supplied by the Southwark and Vauxhall company. It was not only brackish with the influence of each tide, but was contaminated with the outscourings of the metropolis, swarming with infusorial life, and containing unmistakable molecules of excrement. Bearing these facts in mind, the following figures, culled from the records of the cholera epidemic of 1854, are more than suggestive:

In the 24,854 houses supplied by the Lambeth company, comprising a population of about 166,906 persons, there occurred 611 cholera deaths, being at the rate of thirty-seven amongst every 10,000 living. In the 39,726 houses supplied by the Southwark and Vauxhall company, comprising a population of about 268,171 souls, there occurred 3,476 deaths, being at the rate of 130 out of every 10,000 living. Thus the population drinking dirty water appears to have suffered three and a half times as much mortality as the population drinking other water, although in many localities the mains of the two companies ran side by side through the streets, and the supplies of the two companies were so interlaced that it was not possible to define accurately their respective limits, or even to say that the whole of the houses in any particular street were supplied by one particular company.

The significance of these contrasts is made more evident by a glance at the records of the preceding epidemic of 1848-9. At that time the Lambeth Company drew their water from the Thames at Hungerford bridge, and were supplying even a worse water than the Southwark and Vauxhall Company. As already mentioned, in 1853 611 cholera deaths occurred amongst the customers of the Lambeth Company, but in 1848 1,925, or three times as many deaths, had occurred among the same set of customers, who were, however, then drinking water from a more polluted part of the river. On the other hand, the Southwark and Vauxhall Company not only did not secure a pure source of water between 1848 and 1854, but in the latter year were distributing an even stronger solution of sewage matter than during the earlier epidemic. One is justified in inferring, therefore, that of the 3,476 tenants of the Southwark and Vauxhall Company who died of cholera in 1853-4, two-thirds would have escaped if their water supply had been like that of their neighbors, and that of the much larger number—tenants of both companies—who died in 1848-9 also two-thirds would have escaped, if the Metropolis Water Act of 1852, with its stringent provisions prohibiting the abstraction of water from the Thames below Teddington Lock after August 31, 1855, had but been enacted a few years earlier.

EPIDEMIC OF 1866.

The next invasion of this country by cholera was in 1866, and it is memorable for the terrible experiment which was unconsciously carried out by another of the London water companies, at the expense of some 4,000 lives in East London. The disease appeared in London in the last week of June, when six deaths were registered. During the succeeding weeks there were 14, 32, 346, 904, 1,053, 781, 455, 265 deaths, and then the mortality gradually declined, but before the first week of December 5,915 deaths had been registered. Of these, 4,276 occurred in the east districts of the metropolis and adjacent suburban districts of West Ham and Stratford. It was in these districts that the rapid and unexampled development of the outbreak occurred.

Early in the outbreak I was struck by its incidence on the area supplied with water by the East London Water Company, and I felt confident it could only be due to a sudden specific pollution of the water supply. Acting on behalf of a great medical journal I despatched the late Mr. J. Netten Radcliffe (who had not then become attached to the medical department of the privy council) to investigate the matter. At first, of course, he was met with a blank denial on the part of the water company that anything had occurred in connection with their water supply which could explain the distribution of cholera; a refusal to accept any such denial, and a patient investigation, in which the officials gave all necessary aid, though under protest, at last made it plain that owing to changes having been made in

their filtering apparatus the company had sent out for a few days unfiltered water, or water in a very partially filtered state, direct from the river Lee. Subsequent inquiry proved that just at that moment the waters of the Lee had been infected with choleraic discharges from a cottage whose sewers were connected with the river, and in which a family had come to reside who had reached Southampton infected with cholera, and were allowed to pass on after they were supposed to have recovered. The whole history of this outbreak is set out in great detail in Mr. Radcliffe's report included in the appendix to the ninth report of the medical officer of the privy council. Mr. Radcliffe thus summarizes the more prominent questions arising out of the outbreak:

"The outbreak in the metropolis was one of a succession of phenomena which indicated a widespread diffusion of cholera infection in the kingdom during the month of June, 1866, and this diffusion was inseparably connected with a direct dissemination of the infection from the continent. Although facts are not forthcoming which would establish the direct dependence by transmission of the recent outbreak upon the outbreak previously occurring in Western Europe, the conclusion does not follow legitimately that no such dependence existed. . . . . The earliest unquestionable cases of the outbreak took place on June 26th, 1866, on the east verge of the metropolis, upon the banks of the river Lee, and the outbreak reached its acme in the fifth week following. The mortality among the population was proportionately less from this outbreak than from any previous outbreak in the metropolis, but the disease was not less fatal in proportion to the number of persons attacked. Of the total mortality of 5,915, no fewer than 4,276 occurred in the east districts of the metropolis and adjacent suburban districts of West Ham and Stratford. It was in these districts that the disease underwent the rapid and unexampled development which gave to the outbreak such formidable proportions in the fifth and six weeks of its duration. The unusual development of the epidemic in the east districts as compared with the rest of London began in the week ending July 13th. In the week following the rate of increase, as compared with the previous week, was nearly seven times greater than in the rest of the metropolis, but in the subsequent week the rate of augmentation became virtually the same over the whole of London. Neither the meteorology of the period, nor altitude, nor the nature of the soil, nor density of population, nor filth, nor the state of the sewage, nor locality, affords any explanation of the peculiar localization of the outbreak in the east districts. There is but one condition known which might become capable of propagating cholera, common to the whole area of the outbreak, namely, the water supply. The sudden and virtually contemporaneous development of the outbreak over the entire area of prevalence indicated a medium of propagation common to, and capable of rapid diffusion over the whole area; its sudden declension indicated the temporary efficiency to this end of such a medium. The area of prevalence approximated with remarkable closeness to a particular field of water supply, and there are facts which seem to prove that this approximation was not accidental. It is known that, immediately prior to the outbreak in the east districts of the metropolis and neighboring districts across the Lee, impure water was distributed over this field of supply, and it is highly probable that this water was charged with choleraic poison. It is submitted that these facts and inferences supply a sufficient and legitimate explanation of the great and explosive development of cholera in the east of London and its suburbs during the recent outbreak, and it is argued in respect of a serious objection to this theory, arising out of the actual or relative immunity from cholera of certain districts and institutions supplied with the suspected cholera-infected water, that in the present state of our knowledge of the outbreak, the positive and more generally applicable facts may justly and for practical purposes warrant a conclusion apparently in contradiction with certain negative facts of much more restricted application."

During 1866 the cholera was not restricted to London, but was diffused over the whole country, and, in his annual report for the year, the registrar-general showed that it had prevailed, as on former occasions, in particular fields. "The epidemic," he observed, "has been most fatal on the sea coast in the chief ports of the kingdom. It is by no means capricious, but obeys definite laws. It never destroys the people to any extent where the water supply is pure or where the hygienic conditions are good, when the authorities adopt judicious and well-organized measures of early treatment and systematic disinfection. Those districts which are supplied with bad water, have no effective system of sewerage, have no health officer, and have no precautions in force should immediately set their houses in order, as they are still in imminent danger." He further pointed out that, though the cholera had diffused itself over the remotest parts of the kingdom, its ravages had been restricted everywhere except where the people were living in the open violation of the laws of health. "The returns contain many examples of the efficacy of hygienic measures, and afford strong proofs of the doctrine that, if England has suffered less from cholera in the present year than the continent, or less than England herself in former years, it is mainly due to changes which all Europe can appreciate and adopt. Among other instances the Black Country, as it is called, about Wolverhampton may be cited. The epidemics of 1849 and 1854 destroyed in five districts more than 3,000 lives, while in the year 1866 the mortality has been inconsiderable. The water was formerly impure, and could only be obtained with difficulty in a country covered with pits and works. But the people, with commendable energy, have brought good waters from a distance, and are realizing the advantages of the change in Wolverhampton, Bilston and the other towns."

Since 1866 Asiatic cholera has not been able to extend or even to establish itself in England. Cases have reached our shores in 1873, 1883, and 1892, but in no instance has there been any extension beyond the first cases. Sanitary improvement throughout the country has grown apace since 1866. Taking only the last dozen years, the expenditure of upwards of £22,000,000 on water supplies, and of £12,000,000 on sewerage throughout the country, has been officially sanctioned by the local government board. Londoners, as the result in a great measure no doubt of the gigantic experiments to which they were subjected in 1854 and 1866, are supplied to-day with better filtered water than they were thirty or forty years ago. But we can not get away from the fact

that more than half of the water is drawn from the open Thames and Lee, both of which rivers are polluted by sewage above the intakes of the water companies. A few years ago it was calculated by the late Sir Francis Bolton that the sewage of upwards of 70,000 people was delivered direct into the Thames or its tributaries above the intakes of the metropolitan water companies. Supposing a case of cholera could find its way amongst those 70,000 people, and the five and a-half millions supplied by the metropolitan water companies would be only separated from its dread influence by a possibly imperfect filter of sand.

IMMUNITY OF WATER COMPANIES IN DISTRIBUTING POISONED WATER.

I am not quite sure what view the government now takes of the responsibility of water companies for the distribution of polluted water, but I remember very well that in 1871, when cholera was advancing rapidly through Russia, and Baltic ships with fatal cases of cholera upon them were already arriving from Cronstadt at Hull, Mr. Foster in making an official statement in the House of Commons as to the dreaded outbreak of cholera, made a singular remark, on which I made a note at the time and wrote in remonstrance, but without effect. It was worded thus: "Water companies should be mindful that the greatest disasters produced by cholera in this country have been due to their distribution of sewage-tainted water, and every care should be used by them in good time to prevent the recurrence of any such mischief. Their customers, too, should watch them narrowly." This is the extreme application of the principle of *caveat emptor*, which would probably not now be as generally approved as it was then, but I am not aware that in any case, however flagrant, a water company has been held either severely or criminally responsible for the poisoning of its "customers." I am not aware of any legislation which provides that they are or can be held to be liable for such malfaisance of duty. It is, of course, very different for purveyors of unsound meat or of unsound fruit or vegetables, who are duly warned, and by the provisions they are liable to heavy fines and penalties which are frequently imposed for selling damaged goods of the kind. I can not understand the distinction which enables water companies to slaughter on a large scale a helpless population, of whose supply of one of the first necessities of life they hold monopolies in their respective districts, while the smaller fry tradesmen and costermongers are treated with such severity.

(B) EGYPTIAN EXPERIENCES.

In 1831 31,000 deaths from cholera are said to have occurred in Cairo, and Dr. Graves[3] mentions 150,000 as the estimate of the total mortality from that disease in the whole of Egypt in that year. Since then Egypt has been severely scourged by cholera at short intervals, but for our present purpose no reliable data are available earlier than the visitation of 1883. In that year the first cases of cholera occurred at the port of Damietta during June, became prevalent there on the 22d of that month, and before the end of the month had killed some 700 of its 30,000 inhabitants. Gradually declining in Damietta as July advanced, it invaded various towns of the Nile delta, and reached Ghizeh and Cairo by July 16. After July the disease lost its epidemic intensity, and appeared to be extinct by the end of September. According to Dr. Sandwith,[4] the physician to Kasr-el-Aini Hospital, Cairo, who has been able to collect much valuable information concerning the epidemic, 58,511 deaths from cholera occurred throughout Egypt among a population of 6,765,000. In Cairo, among a population of 371,576, there occurred 6,650 deaths; in Ghizeh, with a population of 283,083, there were 3,996 deaths; and in Damietta there were 1,927 deaths. The definite origin of the epidemic has been much disputed, though there has always seemed to me to have been ample opportunity for the introduction of the specific infection into Damietta. Once started, however, the condition of Egypt was exactly such as would favor the extension of the disease.

"There can be no doubt," says Dr. Sandwith, "that Damietta in 1883 possessed all the known requisites for engendering filth disease. In addition to the predisposing causes common to the rest of Egypt, a flat alluvial soil, soaked with decomposing organic poisons, drinking water soiled by every imaginable means, heated stagnant air, an apathetic population and a poverty stricken indifferent government, Damietta had unfortunately at least five other dangers, which affected chiefly the natives of the most crowded and insanitary part of the town. The richer inhabitants drew their water supply from cisterns filled from the Nile at its height, but the poorer folk, living in the quarter of the town where cholera was first seen and was most rife, were entirely dependent for drinking water upon a low Nile for several weeks below sea level, and therefore extremely brackish, or upon an open canal drain which ran through the town and received the sewage of houses on its banks, and also of the public latrines attached to many of the sixty mosques in the town. These conditions prevailed every May and June, but in 1883 must be added the wholesale contamination of the Nile by carcasses of cattle which had died of bovine typhus. One Englishman says that he removed during two months more than 2,000 carcasses in every stage of putrefaction, the greater number being from the Damietta branch of the Nile. The air of the town was in a very poisonous state, and was not improved by the depôts of stinking salted fish (*fisikh*) arriving from the neighboring lake of Menzaleh for the consumption of Damietta and the rest of Egypt. The last of the exciting causes special to Damietta, was the fair which immediately preceded the cholera explosion (June 13 to 20). Some 15,000 people had been allowed without any sanitary supervision to encamp on the outskirts of the town, and to overcrowd the existing 30,000 inhabitants. The wonder is, not that cholera appeared, but that any remained alive to debate its origin."

Speaking in 1884 of the water supply, Sir W. G. Hunter—who was one of the special commissioners sent out by the English government to inquire into and report upon the epidemic of 1883 in Egypt—remarked[5] that the larger majority of the people drink the Nile water unfiltered, and generally before it has been allowed time to deposit. "It is said that they prefer it in this condition. In Cairo the quality of

[3] Dr. Graves's Clinical Lectures, 1848, Vol. I, p. 397.

[4] Paper on Cholera in Egypt, read before the Seventh International Congress of Hygiene and Demography, held in London, August, 1891.

[5] British Medical Journal, January 19, 1884, p. 91.

the water supply is indifferent. At the waterworks there is but one settling tank, and as it is in constant use it can never be cleaned. The large amount of mineral water contained in Nile water while settling carries down with it no inconsiderable quantity of the organic substances held in suspension in the water, and must lead to rapid fouling of the tank. Filtration is effected by gravel and sand. In the Ismailia quarter—that is, the fashionable part of the city—and in the Boulaq quarter also, no attempt is made to filter the water, but it is supplied as obtained from the Nile. Close to the intakes of the Cairo waterworks, where some slight efforts, it is presumed, would be made to prevent pollution of the water, I have seen human and other animal excreta, fresh and stale, lying about in various directions, and men and women bathing and washing their soiled clothes in the river. This was by no means an uncommon sight. The water supplied to Alexandria is, on the contrary, of very good quality. The system, though much the same as in use in Cairo, is carried out in a much more efficient and thorough manner. Alexandria is the only town in Egypt which possesses a wholesome supply of water. The river and the soil have been polluted through countless generations, and the alluvium is almost as absorbent as a sponge. Wherever there is water, it is scarcely too much to say you may feel assured it has been fouled by man. The river is, I may say, polluted and fouled almost from its source. It is the means by which filth, garbage and dead animals of every description are disposed of. Every town and every village situated on its banks add their quota to the fouling of the stream, until at length, when it has reached its lowest level in June, it is found, as at Cairo and at Damietta, to be undergoing putrefactive changes; to present under the microscope the character of pond water rather than as a running stream, and to contain bacterioid organisms in considerable quantities." As a specimen of a quality of the water used by the villagers in Egypt, Sir W. G. Hunter quoted the following passage from a letter written on August 30, 1883, by Mr. Honman, one of the twelve medical gentlemen sent to Egypt by Her Majesty's government for service during the epidemic, respecting Mehallet-el-Kibir, a town of 28,000 inhabitants midway between the Rosetta and Damietta branches of the Nile: "The town has three mosques, the drain from one running through the town, quite open and with three feet of filth at the bottom. This discharges itself into a pool of water at the back of the town, which is used by the people for domestic purposes and as drinking water for their cattle. The other two mosques drain in a like manner into pools outside the town, and they also are used by cattle and for domestic purposes. The stench from these drains can be smelled all over the town."

In 1883 Alexandria was the only town in Egypt possessing a tolerably wholesome supply of water. That supply, however, was by no means altogether safe, and it was laid on to only some 4,000 out of the 16,000 houses in the town. Alexandria also possesses a system of underground sewers, but many of these structures were found to be in a neglected condition in 1883. Yet this town suffered much less severely than the rest of Egypt, only 916 cholera deaths occurring among its 225,000 inhabitants.

During the last ten years a great stimulus has been given to sanitary reform throughout Egypt, but the task is exceptionally difficult and the obstacles are many. Speaking of a visit to Damietta in 1891, Dr. Sandwith remarks that "the existing cisterns are cleaned out and refilled every year, and a large new one built by the government supplies the town for two months and a half. Moreover, a new circular fresh water canal has been excavated to bring Nile water from near Cairo, and the central canal drain of the town has been filled in and converted into a road. The river and the canal no longer contain dead bodies, and the local fair has been shorn to harmless dimensions."

It is unfortunate that the question of providing Cairo with a proper system of drainage is still in abeyance, the initial costliness of an efficient scheme being apparently the real cause of the delay. But there is a prospect of something being done in this matter ere long. The responsible authorities of Cairo, however, will be well advised if they put the sanitary condition of the town into a proper state without further delay, and take care to adopt the most efficient and permanent scheme for that purpose, even if it be at first a little more costly, rather than lay the foundations of future trouble by carrying out an imperfect or temporary scheme.

The water supply of the country is also still far from satisfactory, although the question how best to deal with so difficult a problem has for some time been receiving attention. The latest report of Lord Cromer, the British consul general for Egypt, on the administration of that country and the progress of reform in it, is very hopeful. Dr. Rogers Pasha, who is quoted by Lord Cromer, is able to say that an extraordinary and satisfactory change has come over the spirit of the mudirs and governors. "Two mudirs," he says, "have forwarded me schemes of important sanitary legislation, while all the mudirs and governors it has been my pleasure to meet are unanimous in recognizing the evils which exist, and the necessity for their being remedied."

(c) FRENCH EXPERIENCES.

In 1883 some cases of cholera occurred in Marseilles, but by a conspiracy of silence between the municipal authorities, the attendant physicians and the nurses, their existence was for the moment concealed. In June, 1884, however, the disease broke out in Toulon, and a few days later cases were reported in Marseilles. On this occasion it was not practicable to secure the same secrecy as had been obtained in the previous year. The disease claimed some 30 or 40 victims daily in Toulon during the second and third weeks of July, and before it had entirely disappeared from the town, in the middle of November, it had caused over a thousand deaths there. At the same time it steadily spread in Marseilles, and during the second week of July, the daily mortality there rose to 70 or 80. Between June 27, when the first case appeared, and October 27, when the disease finally disappeared from that town, 1,777 deaths were recorded. Marseilles again suffered in 1885, 1,039 of its inhabitants dying of cholera during the year. Toulon also lost 314 inhabitants from the disease that year. Coming to more recent times, we find that between the middle of September and the middle of November, 1892, some 90 deaths from cholera occurred in Marseilles; and another outbreak of the disease, which the local authorities again strenuously endeavored to conceal,

occurred in February, 1893, and caused nearly 100 deaths.

The sanitary condition of both Toulon and Marseilles at the time of the epidemic of 1884 and 1885 was scandalous. Reporting to the Comité Consultatif d'Hygiène Public de France on July 1, 1884, after an inspection of Toulon in company with Dr. Proust, Dr. Brouardel described[6] Toulon as "one of those towns where the laws of health are most imperfectly observed." He pointed out that the water, though originally derived from springs of good quality, was not free from suspicion of contamination before it reached the consumers, and he described at some length the unwholesome methods of filth disposal in vogue in the old quarters of the town, such as the general practice of casting the night soil each morning into the gutters, where, if, as was generally the case, the water was not abundant and the gradient sufficient, it pestilentially accumulated. A very similar state of affairs is disclosed by M. A. Dominique in his Historical Study of the Cholera Epidemics at Toulon.[7]

The insanitary state of Marseilles is also notorious. In a report on the epidemic of cholera in that town in 1884, M. Guérard, the engineer of the port, pointed out that the most neglected portions of the town as regards cleanliness were those that were most fatally affected, and he especially referred to the old quarters to the north of Port Vieux and behind the Rue Cannebière. Referring to the state of Marseilles forty years ago, when in the absence of sewers the Port Vieux became a receptacle for all the liquid impurities of the town, when local wells were in general use for the water supply, and when closets were but little known, all filth finding its way into the gutters, M. Guérard added that, with the exception of an abundant water service, the same description still held good for the old quarters.

But even at this time the water supply, though abundant, was, and is at the present day, far from satisfactory. Marseilles derives its water from four sources—the river Durance to the extent of 7,000 litres per second, the river Huveaune to the extent of 100 litres per second, the spring of La Rose, five litres per second, and the Grand Puits, which supply six public fountains. The water of the Durance is brought to Marseilles by a canal and aqueduct some eighty miles in length, and as it approaches Marseilles it is exposed to a variety of contaminations. At one point it passes through some flour and other mills, turning the water wheels in its course, and having corn washed in it. At another point it passes in open conduit through a populous locality. Moreover, at its best the Durance is but a turbid river. It carries down a good deal of vegetable matter in its course, and although its waters pass through settling tanks on its way to Marseilles, it is not filtered before its actual distribution. Some elaborate analyses of the Durance water have recently been made by Dr. P. David, of the 15th army corps, and show that in its unfiltered state it is by no means an altogether satisfactory water.

It is, however, the use of the water of Huveaune which is most dangerous. That water is drawn from the river near the village of St. Marcel, and a few kilometres only below the village of La Fenne and the town of Aubagne, the inhabitants of which cast all their slops and filth into the river. In an interesting report on the cholera epidemics of 1884 and 1885, M. Guérard[8] states that nothing in the observation of those epidemics "proves that the waters distributed in the town had any appreciable influence on the mortality from cholera." But at the same time he points out that at La Penne and Aubagne there had been numerous cases of cholera in 1885, and adds that "the use of waters from the Huveaune for domestic wants in the town of Marseilles could not have been without influence in the development of the epidemic in that town." Moreover, he shows that "the water of the Huveaune was drunk in precisely those quarters (of the town) in which the epidemics of 1884 and 1885 made the greatest number of victims."

As further showing the suspicion which very properly attached to the water supply of Marseilles at the time of the epidemic of 1884, the following circumstances recorded by Dr. Proust in his report[9] of December, 1884, on the cholera epidemic of that year in France, are instructive:

A French steamer (Ville de Palerme) left Pointe-a-Pitre on June 24, 1884, and arrived at Marseilles on July 17. It remained there from July 17 to the 24th —that is to say, during the worst days of the cholera epidemic. During its stay at Marseilles there had been no sickness on board; it was not until two days after the departure of the vessel from that port for Havre that the earliest cases of illness on board took place. Between July 26 and 29 five men on board were seized with cholera. The captain narrates that before arriving at Marseilles the steamer had taken on board a supply of water at Gibraltar on July 12, and, acting on the advice given him, there was consumed on board only the water taken at Gibraltar during the whole of the stay of his vessel at Marseilles. But on July 24, the day of the departure of the vessel from Marseilles, the Gibraltar water being almost exhausted, he had to refill his water tanks with the Marseilles water, and that was the water consumed on board after the evening of July 24. The captain himself remarked the coincidence of the appearance of cases of sickness on board with the first use of the Marseilles water, and also that these occurrences seemed to cease at the same time that he ceased to use that water. He gave his crew the water boiled and lightly alcoholic, and after that no new case of illness occurred.

As regards the outbreak in Marseilles in October, 1892, Dr. Brouardel has declared that it was principally due to contamination of the drinking water by sewage.

Happily, both for Marseilles and for the rest of France, as well as for the safety of the health of vessels trading with Marseilles, great works are about to be commenced for the general sanitary improvement of the town. Marseilles has obtained an unenviable notoriety as a focus of cholera, and the efforts at concealment which have always been made have not tended to strengthen public confidence in the good faith of the local authorities.

In the same report from which we have taken the particulars respecting the steamship Ville de Palerme Dr. Proust deals with the spread of cholera through-

[6] Recueil des Travaux du Comité Consultatif d'Hygiène Publique de France, tome 14, 1884, p. 203.
[7] Le Choléra à Toulon, par A. Dominique, Toulon, 1885.
[8] Recueil des Travaux du Comité Consultatif d'Hygiene de France, tome 16 (year 1886) p. 267.
[9] Recueil des Travaux du Comité Consultatif d'Hygiene Publique de France, tome xiv (year 1884) pp. 232, 233.

out the southern and southwestern departments of France in 1884, and, after detailing the facts respecting a great number of localities where the disease prevailed, he arrives at the following general conclusions: "1. The cholera has been imported into the towns and villages of the departments just mentioned. 2. Water has played an important part in its transmission. 3. The intensity of the epidemic has been in direct proportion to the unhealthy condition of the country. 4. The cessation of the epidemic in the localities invaded can in part be attributed to the adoption of sanitary measures and of means of disinfecting."

One of the epidemics included in Dr. Proust's interesting report is that which occurred at Yport, a little town of 1,700 inhabitants in the department of Seine-Inférieure. The facts are also given in a report[10] by that earnest sanitarian, Dr. Gilbert of Havre. It would appear that the department of the Seine-Inférieure had been already free from cholera until the disease was imported by the arrival there on September 28, of two of the crew of the Louise-Marie from the port of Cette. This vessel having arrived at Cette from Newfoundland, nine of the crew shortly contracted cholera, two of the attacks terminating fatally. After this several of the crew traversed France by rail, one dying of cholera on the journey. The personal effects of the remainder were at the same time submitted to some process of disinfection by a sister of mercy. One of the men who left for Yport had suffered from a cholera attack at Cette, and on the day following his arrival (September 29) his clothes were, with the aid of his sister-in-law, wrung out in water and hung up in front of certain dwelling houses. On October 4 this sister-in-law was suffering from diarrhœa, and on her return that day from having completed the washing of these clothes at the public "fontaine" she was seized with symptoms typical of the Asiatic disease and died. Cholera subsequently extended to the filthy narrow streets and bypaths, in which low dwellings, excavated in the sloping surface and having a natural soil for a flooring, supplied the place of houses. In all there were forty-two attacks and eighteen deaths at Yport, the last case taking place about the middle of November.

A very detailed account of the cholera epidemic of 1884 in France has been written by Dr. L. H. Thoinot of Paris, and a concise abstract of it is to be found in Dr. Shakespeare's report on cholera in Europe and India.[11] Dr. Thoinot's investigations go to prove very clearly that cholera follows watercourses, and especially those of little importance, such as torrents and small streams; that water is a means of propagating cholera for both short and long distances; that the cholera manifestly develops around wells or fountains, the water of which has been contaminated by the choleraic germs; that if there exist two kinds of drinking water in a neighborhood, one infected and the other free of all infection, the cholera will attack the neighborhood of the first, but will spare absolutely, or notably at least, the neighborhood of the second; and that cholera is transmitted by linen and clothing contaminated by choleraic dejections. Each of these propositions is fully borne out by the details of the epidemic of 1884. Reviewing these epidemics Dr. Shakespeare remarks that "the disease seems to have spread from place to place by means of soiled personal effects, by small watercourses which had become contaminated with choleraic discharges, or the washing therein of soiled linen, and by the movements of persons experiencing an active or a latent attack of cholera. By these means the disease reached and found a lodgment in many places in the interior of France, remote from the districts at first affected."

The department of Finistère furnishes, unfortunately, a very vivid lesson in the spread of cholera by dirt and polluted water. In that northwestern corner of France the population are poor, very ignorant, and often greatly addicted to intemperance; the soil is filth-sodden and permeable, the water supplies are almost entirely derived from surface wells, imperfectly protected and readily liable to receive specific contamination, and the arrangements for filth disposal are of the most primitive and old world character. Here then are to be found all the accessories needed for a widespread cholera epidemic, and here cholera has ravaged the simple folk in 1832-33, 1834-35, 1849-50, 1854-55, 1865-66 and 1885-86. Whenever cholera has visited France, Finistère or its neighbor, Morbihan has been an early and great sufferer. An exceptionably interesting report of these epidemics, dealing in great detail with that of 1885-86, has recently been written by Monsieur Henri Monod,[12] who is now Directeur de l'Assistance et de l'Hygiène Publiques, but was formerly the Prefect of Finistère. This is how he refers to the water supply of the department: "With rare exceptions the water drunk in Finistère is that of wells; but nearly everywhere the soil is composed on the surface of very permeable calcareous sand. The drinking waters are therefore exposed to infiltrations to whatever flows or rests on the soil becoming impregnated with decomposing matters along the roads and at the corners of the houses. Sometimes even streams after they have passed through all sorts of filth flow directly into the wells, which are destitute of kerbs. The inhabitants know it, they see it; treating it with indifference they do not use the less of it, but drink philosophically a water which will make them ill only if destiny has thus ordained. Consequently, water seems to have contributed to the propagation of cholera on the one hand in disseminating germs of cholera by the streams, by the washing fountains (*les fontaines lavoirs*) by the watercourses of every description, and on the other hand, in introducing those germs into the human organism by the drinking waters. The communes which can be cited as having had the wells particularly infected are those of Douarnenez, Plouhinec, l'Ile de Sein, Guengat, Guilvinec and Quimper. Those who think that water fills in the course of a single epidemic of cholera the double *rôle* of carrier of morbid germs and a direct agent of their introduction, will undoubtedly derive an argument from the precise occurrences in these last two communes."

This outbreak in Finistère was also investigated officially by Dr. Proust,[13] and his opinion is exactly similar to that of M. Monod as to the very conspicu-

[10] Le Choléra a Yport, par M. le Doctr. Gilbert; Revue Scientifique du Decembre, 1884.

[11] Report on Cholera in Europe and India. By Edward O. Shakespeare of Philadelphia. Washington, 1890.

[12] Le Choléra; Histoire d'une Epidémie: Finistère, 1885-6. Annexe aux tomes xix and xx de Recueil des Travaux du Comité Consultatif d'Hygiene Publique de France. Melun, 1892.

[13] Recueil des Travaux du Comite Consultatif d' Hygiene Publipue de France, tome xvi (year 1886), pages 68 et seq.

ous part played by water in the dissemination of the infection. As regards Guilvinec, where between October 1 and December 24, 1885, 71 fatal and 54 non-fatal cases of cholera occurred among a population of 1,968 Dr. Proust states that "almost all the villagers use, for drinking, water furnished by a tank called a fountain situated in the center of the Quartier du Palus, a reservoir which is only a well, and by other wells at different points. This water is the infiltration through the superficial strata. The turf and the sand form a layer of not more than one metre above the impermeable granite. Hence this water is contaminated by all kinds of organic matters, fecal and otherwise, which cover the soil in profusion, and at the time of the epidemic by choleraic matters which it has never been customary to throw on the beach, and which even when disinfected were buried near the dwellings at a depth of fifty to sixty centimetres. It is to be remarked that in two or three houses where rain water is used no case of cholera was observed. But what is still more worthy of interest is the fact that near Guilvinec small villages built on the rock have been free from the epidemic. In one of these villages there were two imported cases, but the disease did not spread. A still more striking example is that furnished by the occurrences at Léchiagat, a village which is separated from Guilvinec by a narrow arm of the sea uncovered at low tide. In 1886 that village had no cholera, although Guilvinec was affected; and although during that year it served as a refuge for a number of the inhabitants of Guilvinec, the disease did not spread in it. But the inhabitants of that village drink water from an irreproachable source, which they found at a distance of two kilometres. Sometimes they drink rain water, but never well water. This little village has always been free from epidemics, whilst small-pox, typhoid fever, and cholera have prevailed on different occasions at Guilvinec."

But by far the most important extension of cholera in France in 1884 was that which affected the western suburbs of Paris, and subsequently that city itself in November. A few deaths had taken place in Paris between July and October, but the first case of the more important outbreak did not occur until November 3. During the following days of that month, the deaths respectively were 1, 3, 18, 14, 28, 76, 95, 96, 79, 83, 65, 70, 45, 36, 47, 28, 34, 25, 15, 19, 10, 14, 8, 3, 11, followed by a rapid daily decline.[14] Between November 3 and December 5, 946 deaths had occurred in Paris. These figures are very suggestive, even by themselves, of a sudden and temporary agency being at work, such as the contamination of the water supply, and although the outbreak does not seem to have been officially reported upon in detail, I have excellent reasons for believing that it was due to the temporary distribution of a highly polluted water to particular districts of the city.

In 1892, Paris, more especially again in its western and northwestern suburbs, was once more somewhat severely visited by cholera. On April 4, the disease broke out in a crowded prison at Nanterre, to the west of Paris, and ere long it had caused in that institution 49 deaths out of 51 attacks. The disease soon spread through the neighboring districts of Suresnes, Puteaux, Neuilly, and Argenteuil. In May there were ten deaths, in June 19, in July 78, in August 211, in September 535, in 535, in October 102, in November 6, and in December 16, making in all a total of 977 deaths during the year. The greater part of this mortality occurred, as already mentioned, in the suburban districts to the west and northwest of Paris, it being, in fact, late in the autumn before any considerable number of deaths took place within the city fortifications. There is a very general concensus of opinion that the consumption of the Seine water was at the root of this serious outbreak, as it has been at the root of previous epidemics. A considerable portion of the Parisian water has been drawn from the Seine near Charenton, but before the intake at that place is reached the river has received, at Choisy-le-Roi, Vitry, and a host of other places, the contents of numerous sewers, etc. Drinking such water is bad enough, but when it is considered that the suburban districts in the west and northwest—those districts, in fact, where cholera raged last year, and where also it began in the epidemic of 1884—draw their water from the Seine, after it has passed through Paris, and been fouled by steamer traffic, by the filth from the clothes and linen washed in its floating washhouses, by the innummerable private sewers at Sèvres, Neuilly, and elsewhere, and by the discharge into it of the contents of the main sewers of Paris at Asnières and St. Denis, one need not wonder at the spread of cholera once introduced. Happily the works which have been in progress for improving the water supply of Paris by the addition of pure water from the Vigne are to be completed in the spring of the present year (1893), and the suburbs are to have their supply of Seine water drawn where that river is not tainted by Paris sewage, and are also to have it filtered through sand and iron before use. The need for some drastic measures of this kind has long been apparent.

D.—ITALIAN EXPERIENCES.

It is to Marseilles and Toulon that Italy is indebted for the severe epidemic of cholera which swept over the country in the autumn of 1884. When cholera broke out in the neighborhood of Marseilles and Toulon, numbers of Italian workmen who were then employed in that neighborhood fled across the frontier into their native country. Strenuous efforts were made to enforce land quarantine against them on the frontier, and thousands of travelers were in consequence detained in lazarettos at Ventimiglia, San Dalmazzo, Bardonnechio, Saluzzo, Pinerolo, and other places; but in spite of bayonets and bâtons, this theoretically perfect but practically discredited method of withstanding the march of infection once more utterly failed; and a great many frightened and unwholesome fugitives, bearing with them in their persons or in their filthy clothing or chattels the germs of the disease, succeeded in evading the cruel police cordons. By July 22 it was alleged that cholera had broken out at Spezzia, having, it is said, been introduced by arrivals from Toulon. Many of the inhabitants of Spezzia at once fled terror-stricken from the town. Gradually the disease spread through the provinces of Turin, Massa, Parma, Bergamo, Cuneo, on to Campobasso and Cosenza in the south of the kingdom. Before the end of the year some 27,000 attacks of cholera and upwards of 14,000 deaths had occurred, at least forty-four out o

[14] Recueil des Travaux du Comite Consultatif d' Hygiene Publique de France, tome xiv, Paris, 1884.

the sixty-six Italian provinces having been visited.

It was in the city and province of Naples that the severest outbreak of the disease occurred. There is a general agreement that the infection was introduced from Marseilles by Italian workmen and sailors, although there may be some doubt as to which of several channels was actually the earliest in operation. According to the United States consul, some fifteen Italian sailors sailed from Marseilles, and arrived in Naples about the end of July. At the time of landing their presence was unknown to the municipal authorities. They passed one night in the Strada di Porto, but, being discovered, they were sent back to their ship and left, presumably for Palermo. Their stay, however, was thought by some to have been long enough for them to have sown the seeds of the disease in Naples; but, according to the British consul, the cholera was most probably introduced by sixty-five Sicilian workmen who, having crossed the frontier from Marseilles, were detained in quarantine for some prescribed period on a floating hospital at Spezzia and thence were shipped to Naples, where they arrived on August 3, and took up their quarters in the Porto district, one of the most squalid and insanitary quarters of the city. On August 6 and August 18 other similar detachments arrived. One man, who arrived on the latter date, put up in the Marcato district another of the worst parts of the town and, sickening with cholera the same night, died within forty-eight hours. Other cases followed, producing in the circumstances well-founded anxiety; but it was not until September 1st that the disease broke out with sudden and considerable violence. On that day there were sixty cases and twenty deaths notified; on the next day there were 127 fresh cases and sixty-five deaths; and so on until on September 11, 949 fresh cases and 357 deaths were announced. This was followed by 848 fresh cases and 386 deaths on the 12th, and 693 fresh cases and 231 deaths on the 13th, after which there was a gradual decrease in the daily numbers until the epidemic practically ceased early in November. Between August 23 and November 9 some 12,345 cases and 7,086 deaths had occurred among a population of 492,908.

Any one who has visited Naples must, while charmed with the unequalled natural loveliness of its magnificent site, have been struck by the squalor and unwholesomeness of the place. After visiting the town just before the epidemic of 1884, I was driven to describe it as the dirtiest, raggedest, most obscene and squalid city of Europe. There was hardly anywhere to be seen a population more poverty stricken, more miserably housed, more filthy in their habits. The atmosphere of a great part of the town was an infection, the defilement of the streets was unspeakable, the mortality of the city was excessive, although it is surprising, almost incredible, that it was not greater. When, therefore, cholera reached Naples in 1884 it found a most congenial resting place, and in the peculiar water supply arrangements in vogue there was the most complete provision for its indefinite extension. That peculiar system, and its relation to the nastiness of the domestic arrangements, are clearly described by Dr. Shakespeare in his interesting work on cholera. He points out that the houses of the poor quarters are many stories in height, and are tenanted by families who live in flats. The upper flats are constructed upon the same plan as the lower ones, the kitchens of all being directly over each other. The water closets, when they exist, usually occupy one corner of the kitchen and connect by untrapped pipes with the main perpendicular drain, which leads to a *pozzo nero*, or sort of filth receptacle in the basement of the house. It is usually only the overflow of the fluid contents of the *pozzo nero* which enters the main house drain and passes to the street sewer. The walls of the *pozzi* are usually very imperfectly, or not at all cemented, the floor of the sink being formed by the porous earth. The solid accumulations in the *pozzi neri* are not often removed more than once a year. In most of the large houses there was at least until 1885, as already stated, a very peculiar individual provision for water. Running water flows in masonry trenches from house to house, ordinarily a little underground. In the course of the trench, as it passes beneath the house, there is a cistern sunk beneath the bottom of the trench, in order to form a species of water reservoir for household purposes. This reservoir is usually located in the part of the building immediately under the kitchens of the various floors, and is in communication with them by means of a bucket attached to a rope which runs over a pulley at the top of the house, so that the occupants of the various stories can draw the water without the necessity of descending to the ground floor. The location of these reservoirs is therefore frequently in close proximity to that of the *pozzi neri*, and, from what has already been said of the construction of these *pozzi neri*, it is easily understood how filtration from them must unavoidably reach and contaminate the water of the reservoirs. And the fact that the water trench passes from house to house and directly communicates with the reservoirs explains how, in houses where the *pozzo nero* and the reservoir are quite distinct, the water drawn from the reservoir is often necessarily contaminated by the *pozzi neri* of houses up stream.

Besides this household provision of water, there is also a public supply by means of a comparatively limited number of public fountains in the streets and public squares. The majority of the inhabitants recognize the fact that the water of the public fountains is of a better quality for drinking purposes than that drawn from the reservoir within the houses, and those living on the ground floors and not too far distant from the nearest public fountain habitually resort to the fountain for their drinking water, using, however, the reservoir water for other domestic purposes. Dr. Shakespeare notes in connection with this practice the curious fact that during the prevalence of cholera in Naples in 1884, and, indeed, in nearly all of the preceding epidemics, contrary to the customary rule in cholera epidemics in most parts of the world, persons dwelling in the upper stories suffered the most severely from the disease. The explanation of this fact is patent. The ease with which those people could obtain water from the reservoir, and the inconvenience of resorting to public fountains, caused them to use water which was by far the most likely to be contaminated by cholera discharges.

In addition to the contamination of the reservoir water by cholera discharges which might reach the *pozzo nero*, in not a few instances the reservoir water was further contaminated by the reckless practice of washing linen soiled with choleraic discharges in the trenches of running water beneath the houses.

It is difficult to realize the fact that such a system as this—a system which could scarcely be better designed for the most effectual distribution of disease—was to be found towards the close of the nineteenth century in such a populous and important city as Naples. Fortunately the danger was at last recognized in 1884, and in the following year pure water was brought into the city from a mountain stream—the Serino, eighty miles distant—and was very generally distributed through iron pipes under pressure. At the same time the old system of distribution by water trenches coursing beneath the dwellings was, to a great extent, done away with. Neither in 1885 nor in 1886, notwithstanding the existence of cholera in the vicinity and the not infrequent arrival of refugees from cholera stricken localities, did Naples suffer from even limited epidemic outbreaks of the disease. This was true also of the year 1887, until, in consequence of a break in the new water conduit from the distant mountain stream, recourse for a few days was had very generally to the old water system. At this time there were numerous refugees in the city as, in fact, there had been for weeks past from various places in southern Italy and Sicily, including several suburban towns where cholera was more or less prevalent. Moreover, there were, and had been, almost constantly occurring a few isolated cases of the disease among these refugees without, however, a local epidemic being produced thereby. But very soon after the interruption of the supply of the Serino water there were one or two quite sharp explosions of local epidemics around some of these cases. The speedy repair of the Serino aqueduct enabled the municipal authorities again to turn on that pure water throughout the city, and, practically coincident with that action the local epidemics, which had occasioned so much alarm, ceased almost as suddenly as they had begun.

It is interesting in this connection to note that there has been a marked decrease in the prevalence of enteric and typhus fevers since the introduction of the new water service into Naples.

The disease reached the city of Genoa in September, 1884, and the severe epidemic which immediately ensued is one of the most interesting and conclusive examples recorded of the spread of cholera by water—by water, moreover, which was of exceptional natural purity until the moment it received the specific infection.

A few sporadic cases of cholera occurred in Genoa during the first fortnight of September; but immediately following the 21st of that month the disease suddenly and rapidly spread, there being 9 cases on September 24, fifty-two cases on the 25th, 42 on the 26th, 38 on the 27th, 47 on the 28th, 64 on the 29th, followed by a rapid decline to 59, 40, 22, 21, 23, 22, 12, 13, 10, 5, 6, 3, 6, 2, 5, 7, 0, 1, 4, 4, the last case occurring on October 20. The deaths during the days following September 22 were 2, 2, 18, 32, 27, 37, 47, 30, 19, 25, 28, 20, 22, 17, 10, 10, 13, 10, 10, 10, 3, 6. These figures are themselves very suggestive of a water influence, and this explanation of the epidemic spread was strongly confirmed by the circumstance that, during the early days the disease not only attacked indifferently the poorest and the richest quarters, but was also singularly disseminated throughout the whole city. In the penal Bagno di S. Giuliano, an isolated place where the prisoners are kept in strictest confinement, there were five cases in the first five days of the epidemic, and at the same time the disease made headway upon the heights of S. Benigno at 80 metres above the level of the sea. In every part of the city there were attacks, without distinction of the density of the population, or of social status, or of hygienic conditions or precautions. The dissemination was so general that the first 300 cases were found to be scattered along 158 different streets of the city.

Early in the epidemic a resident physician, an old friend of mine, whose acquaintance I had made when I organized and despatched, with his aid and that of Dr. Wolfe, a convoy of medical succor to the army of Garibaldi on his famous expedition from Sicily, telegraphed to me from Genoa: "Your water theory of cholera at fault. Genoa has a fine supply of pure water from a high mountain source. Cholera has broken out in districts so supplied, and we have already 100 cases a day. What is to be done?" I replied by telegraph: "Can not be at fault; must be water; can not be anything else; examine every foot of your water pipes, and trace to the supply pipes' source." Genoa, it may be remarked, is supplied by three aqueducts—the Civic and the Galliera about fifteen miles long, fed by the river Gorgento, and the Nicolay about thirteen miles in length, and supplied by the river Scrivia. An analysis of the first 50 cases of cholera in the city disclosed the fact that as many as 44 were in houses supplied with Nicolay water; of the 50 succeeding cases 43 dwelt in houses supplied with Nicolay water; and of the third group of 50 cases, 45 were in houses so supplied. In fact, out of the first 300 cases, as many as 93 per cent. inhabited houses in which the Nicolay water was distributed. Further, although the poorhouse of the town is in a very crowded center, no case of cholera occurred in it, as the authorities of that institution cut off the Nicolay supply. Again, taking the Via Bianchetti, cases of cholera occurred on the side which was served with Nicolay water, while there was not a case on the other side, which had water from a different source.

Thus the Nicolay water stood convicted, and on further investigation the mystery was readily solved. Near the beginning of the Nicolay aqueduct is the village of Busalla, and at the time in question some hundreds of workmen including, there is reason to believe many refugees from infected localities, were engaged on a new railroad and are described as living in the most filthy conditions. Cholera broke out at Busalla on September 14, and several cases thereafter daily occurred until the end of the month. Inquiry disclosed the fact that nearly all the workmen, both the sick and the healthy, had their clothes washed in the Scrivia, or in a tributary of that stream, which supplies the Nicolay aqueduct with its water.

As soon as these facts were known the mayor of Genoa, with very commendable promptitude and decision, prohibited for a time the distribution of the water of the Nicolay aqueduct, or rather the distribution by that aqueduct of the water of the Scrivia. This was done on September 28. On September 30 the cases of cholera fell from sixty-four to fifty-nine, and, as already shown, during the succeeding days the number of cases suddenly dropped to 40, 27, 22, 21 followed by a rapid decline to *nil* on October 17.

In 1885 cholera occurred in various parts of the

mainland of Italy in the provinces of Ferrara, Genoa' Massa, Modena, Parma, Reggio Emilia, Rovego, Trepani, Venice and elsewhere. But the severest visitation that year was at Palermo, in Sicily. Into that town, which has been richly endowed by Nature but has been rendered most unsavory by man, the cholera was imported from Marseilles by the steamship Salunto, in spite of the fact that that vessel had been subjected to seven days' quarantine in the Gulf of Assinara. Between August 23 and 25, 1885, a woman living in a little street in Palermo received, for the purpose of washing, a parcel of linen which had been sent to her husband, a sailor on board the Salunto. That woman, after having washed the linen, was seized with vomiting and diarrhœa. On the following day a young woman who lived with her developed the same symptoms, as did also several other women in the neighborhood during the next few days. On September 13 there were thirteen cases and four deaths, on the 14th there were thirteen cases, on the 15th seven cases; but on the 16th the number of cases suddenly sprang to 36; on the 17th to 132; on the 18th to 221; and on the 19th to 258. From that date the disease began slowly but gradually to decrease until the middle of November, by which time 5,535 cases and 2,959 deaths had occurred in Palermo among a population of about 275,000.

The opportunities for the spread of the disease when once introduced into Palermo were very similar to, though much more pronounced than those in Naples. The water supply is brought from the surrounding hills, usually in open trenches of masonry. Within the town these trenches are sometimes uncovered,or they pass beneath the houses,in the basements of which there are traps in the top of the water trenches for the purpose of enabling the water to be taken from them direct. There are also a number of public fountains throughout the city supplied by this running water, and there are many wells exposed to all the most filthy contamination. The washing of clothing is very common in the water trenches, both before and after the city limits are reached.

The habits of the people are of the most filthy character, and in the presence of the cholera the ignorance and superstition of the populace greatly harassed the authorities and increased their difficulties. It is owing in great measure to the enlightened and vigorous action of Dr. Albonesi, who was appointed director of the local sanitary council, that the early termination of the epidemic is mainly due. That Dr. Albonesi thoroughly understood the methods by which cholera spreads is shown by an eloquent pamphlet which he published shortly after the epidemic on the duties of governments and countries during epidemics. He directed the closing of all wells in the affected localities, and inaugurated thorough cleansing operations of all kinds. The closing of the wells was followed by the decline of the epidemic. On his advice also the boiling of the water before use was very generally adopted by the more intelligent inhabitants, and with marked benefit as regards their immunity from infection.

I have only given details of the three greatest outbreaks in Italy in 1884-85, but every community throughout the country that was attacked by the disease taught the same lessons.

(E) SPANISH EXPERIENCES.

In 1885 Spain was the seat of a cholera epidemic of exceptional ferocity, which, having sprung from a few initial imported cases, rapidly embraced the greater part of the peninsula. There is, unfortunately, little sign at present that Spain herself has profited from her terrible lesson, but for those who wish to master the mysteries of cholera, the Spanish epidemic of 1885 illustrates clearly the futility of so-called quarantines, both on sea and on land, and the potent agency of rivers and streams, once infected, in spreading the disease for long distances, when the populations living on their banks drink their waters.

The earliest cases of cholera occurred in Alicante, on the southeast coast, towards the end of August, 1884. There is, as usual, some conflict as to the exact manner in which the infection first reached Spain. According to one account, a family of Spaniards returning from Marseilles was responsible. That family sailed from Marseilles to the French province of Oran, on the northern coast of Africa, where they procured transport for themselves and for their personal effects to a maritime village near Alicante. They successfully evaded the surveillance of the Spanish quarantine officers, and carried, it is thought, the germs of the disease with them. According to another version, the disease was brought by a vessel from Algiers, which, after performing a week's quarantine at Alicante, proceeded to land her passengers. Among the latter was a family from Cette, which took up its abode in the house where cases of cholera subsequently appeared. During the third week of September isolated outbreaks occurred in the province of Tarragona, also bordering on the Mediterranean, and in the neighboring provinces of Lerida and Saragossa. Later on, in November, cases cropped up in the coast province of Valencia and in the inland province of Toledo.

The disease slumbered through the winter around Gandia, in Alicante, and in the following April broke into an epidemic at Játiva and Alcira. From these quarters the disease was soon carried far and wide by the laborers who usually disperse in May from the rice plantations of Valencia. Henceforward sanitary cordons and such like measures failed to stay the march of the epidemic; indeed, in some instances they seem to have had the contrary effect. Without attempting here to follow that march step by step, the result may be summarized from a tabular statement issued in May, 1886, by the Spanish minister of the interior. It appears that between the first cases of the disease notified on February 5 in the province of Valencia, until the last cases notified on December 31, 1885, in Salamanca and Cadiz, 2,247 local governments ("ayuntamientos"), included in 46 provinces, and having an aggregate population of 6,576,641, had been invaded, 338,685 cases and 119,624 deaths having occurred among them. The population which escaped the scourge is stated to have been 10,396,839, distributed among 7,067 local governments.

Sanitation and domestic hygiene are of a very primitive description in Spain, if indeed they can be said to be at all regarded by the bulk of the population. The streets and roads of the towns and villages, and the back yards of the houses are, without any consideration for decency or health, made the depository of nearly all the fecal and other filth of the population; the dwellings of all but the wealthiest are old and unwholesome, with frequent

accumulations of filth close beside them; and drainage properly so called may be said to be non-existent, only a very few of the largest towns possessing any system of drainage whatever.

The open rivers and streams are the usual sources of water supply, and in Valencia and some other provinces the open agricultural irrigation canals serve also for the domestic supplies. But these rivers and canals too often serve as public sewers, and, as in France and Italy, the washing of clothes is usually performed in them. In some cities and towns there are also wells; but, apart from their being sunk in a recklessly polluted soil, there is seldom any attempt made to protect those wells against infiltration of the filth which so often surrounds them. In Murcia and Andalusia there is still the old Moorish custom of storing water in huge earthen jars. These jars are sometimes to be found ranged around the house courts, reminding one of tales of the Arabian Nights, but often they are sunk beneath the floor of the yard where they are in close proximity to the *cloaca negra* or cesspit of the establishment, and are liable to receive the overflow or soakage from it. These *cloacas negras*, it may be added, when they exist receive all the fecal and other filth of the household, and their contents usually soak away into the surrounding soil.

In a work published in 1886, on cholera in its relation to water,[15] Mr. George Higgin has dealt very clearly with the Spanish epidemic of 1885, and by comparative pictures of the circumstances of several typical towns, he has graphically and conclusively shown that it was *par excellence* a waterborne epidemic that, specifically infected, more than any other unwholesome circumstance was the cause of the fearful mortality and misery which then spread throughout the length and breadth of the peninsula. He shows that this formidable disease never became truly epidemic or dangerous in any Spanish city in which there was a pure and good supply of water, and where proper means were taken to guard against the sources being polluted by any of the specific choleraic poison. He shows how, in this way, the cities of Toledo, Seville, Malaga and Madrid escaped comparatively lightly, while such places as Aranjuez, Saragossa, Granada and Valencia suffered very severely.

Taking Madrid, it is noticeable that out of a population of 397,816, there were only 2,207 attacks and 1,336 deaths, or barely as many as occurred in a couple of days in the previous epidemic of 1865. The water supply of the town is derived from the Lozoya river among the Guadurama mountains, and was completed shortly before 1865. The greater part of the drainage was also then completed, but at the time the new water supply had scarcely come into use, the large majority of the houses being supplied from the old fountains which existed in various parts of the city. During the last twenty-five years the use of the Lozoya water has become very general, and an ample supply has been provided for washing the streets and flushing the sewers. Madrid is well drained, but the means of disposing of the sewage is very unsatisfactory.

When the existence of cholera in Madrid was recognized in 1885, one of the first acts of the municipality was to attend to the water supply. There existed 11 ancient sources which supplied 85 taps or fountains, 22 of which were public, and at which water carriers were allowed to fill their barrels, while the remaining 63 belonged to groups of houses. In spite of the excellent supply brought in from the Lozoya, these old sources were still a great deal used by the inhabitants—many, from old habits, preferring to use the same water which their fathers had used, while many were not willing to incur the expense of laying on the new supply. In view of the impossibility of effectually guarding against the possible contamination of some of these sources of supply, the municipality, by decree, closed all of them except one. The central government undertook the custody of the Lozoya aqueduct, and during the whole time of the existence of cholera in the city the uncovered portion of that aqueduct was patrolled by armed guards, no one being permitted to approach it without special order. There is every reason to attribute to these energetic measures the comparative immunity of Madrid from cholera during the epidemic of 1885. Such cases of the disease as did occur in the city seemed to be associated not with the water, but with the outfalls of the sewers, around which they seemed to cluster.

Toledo, the ancient capital of Spain, now having a population of about 20,000 differs widely from Madrid, its sanitary arrangements being much worse. It was supplied with water from the river Tagus, which flows round the city, the water being lifted by pumps. Above Toledo, on the same river, is situated Aranjuez, and above that town again, on the Manzanares, which is a feeder of the Tagus, is situated Madrid. In both of these latter towns cholera existed in 1885, being unusually severe at Aranjuez. The governor of Toledo, recognizing the suspicious character of the water, promptly stopped the pumps and obliged the inhabitants to send for their drinking water to a distant spring, and even forbade any one to bathe or wash clothes in the river. The measure was a strong one but it saved the city, for there were not more than 200 cases there during the epidemic.

Next, Mr. Higgin points to Seville, the third city in Spain, with a population of 134,000, and with very bad sanitary arrangements. There is no proper drainage, and the city is not healthy. The town, however, possesses an excellent and well protected water supply. But one of the suburbs of the city called Triana, containing about 30,000 inhabitants, is situated on the western side of the river Guadalquiver, which is fed by the rivers Darro and Genil which flow through Granada, and the poor in this suburb drink generally the water of the river. The Seville authorities, however, in good time prohibited the use of any water from the river, either for dietetic or other purposes. The result was that Seville practically escaped the disease, although it raged fearfully in Granada higher up the river, and descending the river Genil, which runs through Granada, attacked the towns of Herera, Ecija, and others in the province of Seville. It broke out also at Cordova and other towns on the Guadalquivir, of which the Genil is an affluent, and it appeared in Palma, Utrera, Puerto Real, Puerto Santa Maria and Cadiz, forming a circle around Cadiz, but the city itself escaped almost completely. Xerez, which lies between Seville and Cadiz, and possesses an excellent water supply, also escaped the disease. Malaga, which is in a bad

[15] Cholera in its Relation to Water Supply, by George Higgin, 1886.

sanitary condition, except that it has been provided with an excellent water supply, also escaped very lightly.

Taking now some towns which were severely visited by the cholera, it is seen that Granada, with a population of 76,000, has bad sanitary arrangements, only a tithe of the houses being drained. The water supply is from the Genil and Darro rivers, to which we have already referred. A small portion is supplied from a spring. The canals carrying the water from the rivers are uncovered, and exposed to all kinds of contamination. The cholera broke out in July, spread with frightful rapidity, and by the middle of August over 450 cases a day were officially recorded. No attempt had been made, as at Toledo, to suppress the old water supply. From Granada the course of the cholera may be followed down the rivers Darro and Genil, the infected waters carrying death wherever they were used for drinking purposes.

Murcia, with a population of 91,000, from which the cholera was imported into Granada, suffered heavily also. The disease was carried into the plains of Murcia by the waters of the river Segura from the baths of Archena, it having been imported into Archena by some invalid soldiers from the infected districts around Valencia. The plain of Murcia is irrigated by the waters of the Segura, and the disease commenced in this district with the death of a laborer who had drunk the water of one of the irrigation canals. The epidemic raged principally among the little cottages scattered thickly over the plain.

According to Mr. Higgin, no case in reference to water supply is so instructive as that of the town of Valencia. This city is fairly well drained, as drainage goes in Spain. The water supply is derived from the river Turia, is passed through sand filters, and is stored in a covered reservoir. When cholera broke out in the spring of 1885, it came very near Valencia, but did not touch it. At last, in the middle of May, having crossed the water supply of the city and thoroughly infected the river, it fiercely attacked Valencia, and by the end of June the number of cases had risen to 700 a day, among a population of 143,000.

The experience of Saragossa is also instructive. Its principal water supply is derived from the Aragon canal, which in its turn, is fed by the Ebro, near Tudela. The water became infected, the disease broke out in Saragossa, and some 10,000 cases occurred among a population of about 84,000. The preventive measures adopted by the authorities unfortunately came too late.

These cases could be multiplied almost indefinitely, and the same lessons be learned from them.

(F) RUSSIAN EXPERIENCES IN 1892.

The complete history of the cholera epidemic in Russia in 1892 remains still to be written, but what we know of it bears out previous experiences as to the influence of infected water. We venture to take the following extract from some very interesting papers on the subject which have been written by Dr. Frank Clemow[16] of St. Petersburg. Speaking of the distribution of the epidemic, Dr. Clemow says that "the experience of last year's epidemic has added a large body of evidence to that furnished by earlier outbreaks upon which conclusions may be founded as to the means by which cholera is spread from one district to another. In tracing the disease from its first introduction across the Persian frontier throughout the Russian empire it has, I think, been clearly shown that cholera followed the main lines of human communication; and that where these lines coincided with a great river—such as the Volga—the spread of the disease was much more rapid than where communication was mainly by railways. These were the conclusions to be drawn from the behavior of the epidemic as a whole. The object of the present article is to bring together evidence as to its behavior in individual cases. The evidence has been collected from various sources, but principally from the discussions at the conference on cholera held in St. Petersburg last December, and from the medical and lay press at the time of the epidemic. In almost every instance that has been recorded where the means by which the infection was carried was known the course of events was somewhat as follows: A person coming from an infected district to one that has hitherto been free from the disease, sickened with cholera soon after his arrival. The earliest subsequent cases in the town or village occurred among members of the household of the first patient, among persons who had been in contact with the first patient or with articles soiled by him, or among persons who had drunk water from sources polluted, directly or indirectly, by the dejecta of the first patient. I may be pardoned for giving in detail the following instructive histories: In the village of Ulybyshef (Vladimir government) a laborer arrived on June 29 from Kazan where he had attended the funeral of his brother, who had died from cholera. Three days later he sickened with the disease in the morning and died in the same evening. The clothes he had worn remained in an outbuilding for a week. They were then washed in the stream from which the village drew its water supply. In a very short time cholera became epidemic throughout the village. In the government of Viatka, five villages situated along the banks of the same stream were invaded by cholera. The infection was traced to the systematic washing of linen, belonging to the early cases in the stream which provided the inhabitants of all the five villages with their drinking water. No sooner was this practice forbidden than the epidemic began to abate. In the village of Upper Moulla (Penn government) an exactly similar relation of cause and effect was recorded. The linen of cholera patients was washed in a pond. From the same pond the inhabitants drew their supply of drinking water, with the result that cholera raged throughout the village. As in the last instance, as soon as the washing of linen in the pond was put a stop to, the number of cases of cholera in the village began to diminish. In the village of Borki (Samara government), lying on the river Samarka, the first case of cholera was that of a woman. After a short interval a peasant was seized with cholera upon a barque lying at anchor a short distance further down the river. The disease then became epidemic solely among that portion of the population which drew its drinking water from the river. The remaining inhabitants, who drank water obtained from wells, remained free from the disease with but one or two exceptions. In Great Bereznikof, a village in the Simbirsk government, an exactly parallel instance was recorded. Cholera attacked only that part of

[16] Lancet, May, 1893, p. 1,055.

the village which drew its water supply from the river Kshi, while among the inhabitants of the village whose drinking water was derived from wells, there was but a single case—that of a beggar woman to whom had been given some clothes from an infected house. In two villages in the Tambof government, in each of which a dual water supply existed, it was observed in like manner that cholera was confined to one portion of the inhabitants. In each instance it was found that this portion of the inhabitants drew its water supply from a pond contaminated through the washing of linen of cholera patients. The rest of the village, supplied with well water not so contaminated, did not furnish a single case of cholera. The part played by water in the diffusion of cholera was clearly illustrated at the beginning of the epidemic in St. Petersburg. It was found that the earliest cases were confined to the workmen in the large factories situated on the banks of that branch of the Neva known as the Great Nevka. The workmen were accustomed to drink water derived directly, without filtration or boiling, from this branch of the river—water which at all times is charged with much organic matter (14 parts in 100,000), and which produces gastro-intestinal catarrh in all persons unaccustomed to its use. It was at once arranged that water should be supplied to the workmen from the town waterworks, and that this water should be filtered or boiled before drinking. The effect of the change in the water supply was immediate, and there was no further spread of cholera in that part of the city. Another instructive case was furnished by one of the St. Petersburg prisons. A prisoner who had been in solitary confinement for more than a month was suddenly seized with all the symptoms of cholera. Bacteriological and *post-mortem* evidence confirmed the diagnosis. All the prisoners were supplied with boiled water, and for a time the source of infection remained an enigma, which was only solved by the discovery that the deceased had drunk a quantity of unboiled water, provided to him for washing purposes. Steps were immediately taken to furnish all the other prisoners with boiled water for whatever purpose required."

In an interesting report by the United States consul at Tashkent, in Turkestan, dated October 11, 1892, I also find the following interesting statements:

"That the cholera germs were taken into the system through drinking impure water my experience and personal observation confirm. At Samarcand three regiments of infantry were encamped side by side on a level plain close beside a stream of water. The colonel of one of these regiments took the most extraordinary pains to prevent his men from being attacked with the cholera and he succeeded. In the first place he caused every article in the camp to be thoroughly cleansed with hot water and disinfected. He compelled his men to bathe every day in water that had been boiled, and a guard was constantly maintained whose duty it was to keep the soldiers from drinking the river water, and to carry out the colonel's instructions. The result was that not a single case of cholera occurred in the regiment, while the other two regiments which were camped alongside lost over 100 men from cholera. In these latter regiments the ordinary precautions were taken, but no such measures were adopted as I have mentioned above.

"At Ashabad the cholera had almost disappeared early in August, and the event was celebrated with much rejoicing on the Emperor's name day, which occurs in that month. The governor-general gave a dinner to which he invited a numerous company, and to the various regiments were granted extra rations that they might rejoice on the occasion. The day which began so auspiciously amidst general rejoicing was destined to have an ending which has no parallel in history. Of the numerous guests who attended that dinner, one-half died within 24 hours. A military band of about 50 men, who played during that fatal dinner, lost 40 of their number with cholera and only 10 of the men reached camp that night. One regiment lost half its men and 9 officers ere the sun rose the following morning, and within 48 hours 1,300 people died of cholera. The cause of this outbreak was clearly traced to a small stream of water which supplied the town. Four days previously the authorities were informed that cholera had broken out at a small Turcoman village, situated on the banks of this stream, about 4 miles from Ashabad. The inhabitants of this village were ordered to move their kilrtkas (tents) several miles back on the hills, which they did. On the day previous to the reappearance of the cholera at Ashabad, a very heavy rainstorm occurred, which washed the banks of the river, and swept refuse and other matter from the abandoned village into the stream, and this matter was carried by the water into the city and distributed to all parts of the town by the numerous open canals through which the inhabitants were supplied with water. It was this contaminated water which caused the reappearance of the epidemic, and the frightful mortality which followed. The population of Ashabad was not more than 13,000, of which 10 per cent. died within 48 hours."

(G) CHOLERA AT HAMBURG IN 1892.

The secrecy and prevarication attempted last year at Hamburg, when cholera appeared in that city, are much to be regretted. Great risk was thereby incurred in other seaports where, had the presence of the disease in Hamburg been known, the exercise of a little extra vigilance, but without the imposition of quarantine, would have probably secured the detection before landing of any suspicious cases from the north German town. Although August 21 was the first day on which the presence of cholera in Hamburg was officially admitted, there is no doubt that cases had occurred there quite a week before that date. The public announcement that on the first day as many as 83 cases and 22 deaths had occurred naturally caused a feeling of much anxiety throughout Europe and America, for in times past Hamburg has been a very frequent distributor of the disease. How the infection was first introduced last year into Hamburg is still a matter of dispute, but there can be little disagreement with the opinion that when once it was started the public water supply was the vehicle of its dissemination.

The strongest and most striking evidence of this is afforded by the relative incidence of the disease on Hamburg, Altona and Wandsbeck, which together make up the Greater Hamburg. Wandsbeck, with a population of 20,571, had 64 cases (3.1 per mille), and 43 deaths (2.0 per mille; Altona, with 173,279 inhabitants, had 572 cases (0.9), with 329 deaths (2.3); Hamburg State, with a population of 622,530,

had 17,974 cases (28.8) and 7,611 deaths (12.2); or, taking only the infected parts, the town and suburbs of Hamburg, among 579,907 inhabitants there were 17,891 cases (30.8) and 7,582 deaths (13). This striking difference between Wandsbeck, Altona and Hamburg is distinctly traceable to the water supply. Thus Wandsbeck, which suffered less than the other two, is supplied with spring water, whereas Altona and Hamburg derive their water from the Elbe. Altona, however, gets its water very far down, at Blankensee, where the river is cleaner than in Hamburg, and passes it through a good gravel filter, unlike Hamburg, which gets its water from the harbor contaminated with sewage and absolutely unfiltered. These facts led Dr. Hueppe,[17] who spent the whole of last September in Hamburg, as well as most other observers, to the inevitable conclusion that the water of the harbor and the waterworks was answerable for the outbreak and rapid spread of the epidemic.

On behalf of the *British Medical Journal*, the history of the water supply of Hamburg has been investigated by a special commissioner on the spot, and its history has been examined from a series of official and other publications.[18]

HISTORY OF THE PRESENT SYSTEM.

According to the official volume, "Hamburg and its Buildings," published by the Hamburg Architects' and Engineers' Association in 1891, the oldest system of water supply, which was established in the fourteenth, sixteenth and seventeenth centuries, was replaced in 1822 and 1843 by new systems, where steam power was first used. They were only in force in part of the town, but are not entirely out of use in certain districts at the present time.

After the great fire in 1842, W. Lindley undertook the water supply of the entire town, after Mylne's system, then in force in London; by 1849 the new supply was in full working order. In July, 1890, the sand filtration system of the water pumped from the Elbe was established at the central depôt of the waterworks at the expense of 7,000,000 marks, and it now supplies districts including a population of nearly 800,000 souls. There are 64 fountains in Hamburg city, 39 being for drinking purposes; but of course the ornamental fountains and "market fountains," so familiar in Germany for public laundry work, play out water accessible for persons who may be more thirsty than prudent and more thrifty than foreseeing. There remains the supply to private and public houses and offices. The Altona waterworks at Blankensee supply a population of 140,000; they were originally built after Hawksley of London's plan, in 1857, and nearly half of the present buildings remain as he projected them, but improvements were made on a large scale in 1873–5 and 1884–8. Extensive sand filtering beds were then constructed. It was on the recommendation of Herr Henry Gill, director of the Berlin waterworks, and Augustus Fölsch, that sand filtration was introduced at Hamburg.

THE NEW SYSTEM.

Herr Arnold Samuelson, engineer to the Hamburg works, has published a treatise on the establishment and working of the new system in his city. The later treatises, pamphlets and articles on this filtration, published this year are, as might be expected, less congratulatory than those issued at an earlier date. Herr Samuelson implies that the results are not satisfactory, while in a work on the lighting, drainage and water supply of Hamburg published in 1887 it is stated, at the conclusion of the paragraphs on the drainage and sand filtration, that the Elbe water purified by this system is remarkably good, especially pleasant and wholesome to drink, and at the same time well suited for ablution and laundry work, owing to the small quantity of calcium salts which it contains. The system is doubtless good, the filter beds have been excavated and paved with care. But not only may the water be polluted between the filter beds and the public fountains and private cisterns, as evidently occurs; not only do a large waterside population drink water direct from the Elbe, but there remains the fact which long descriptions of new designs of filter beds must not make us forget; a considerable district is yet supplied by a system seventy years old. Evidence is also not wanting that the water fresh from the filter beds is not free from germs; indeed, it appears to be infested with them.

THE ELBE WATER AND SAND FILTRATION.

This turns our attention to another fact—that the supply of water is from the Elbe. It is quite possible to filter away solid bodies and to precipitate noxious inorganic chemical salts, but organic germs can not be removed by retaining millions of cubic feet of water from one of the great muddy continental rivers in extensive open filtering beds. A few pints of water are easily purified, perhaps without boiling, in the wards of a hospital, but none would willingly rely on sand filtration alone for purifying water from a river which has run for hundreds of miles through hundreds of towns and villages. At least such filtration would never be trusted had an epidemic once broken out in the neighborhood of a hospital. When it comes to the purity of the water supplying a great city, the insufficiency of sand filtration of river water is thus rendered self evident.

Among the rules issued for the public benefit by the Imperial sanitary board we find clauses relating not only to ditch water, river water and water from the basins of town pumps and fountains, but also to "suspicious water" from any source. The citizen is warned not to drink any water that may in his own opinion be suspicious, and he is also reminded that small house filters are untrustworthy, not being perfect purifiers of water which may be impure when put into the filter—the Hamburg water being no doubt borne in mind when this caution was framed—besides being specially dangerous when not kept perfectly clean by frequent changing.

THE PAST OF THE WATER.

Judging from official and medical works on Hamburg, that city has suffered very severely in the fourteen epidemics of cholera which, beginning in 1831, have hitherto visited that city until the last appearance of the disease in 1873. In all these publications the water is blamed; but it is the Elbe water fresh from the river that is meant even when not specified. In all the visitations the waterside poor were first attacked, and this truth, confirmed by statistics, is only what might have been expected.

[17] Berlin. klin. Woch., Nos. 4 and 5, 1893.
[18] British Medical Journal, September 22, 1892, p. 708.

But an elaborate work on Hamburg, its natural history and medical aspect, lays all the blame on unfiltered Elbe water and those who drink it; and this work appeared in 1876—that is to say, three years after the last epidemic. The explanation therein given as to the way in which the disease spreads to the wealthy, and to parts of Hamburg far from the Elbe and Alster, is clearly a hypothesis on which the authorities have been lulled into a false security.

The epidemic of 1892 shows that something has been overlooked. The first to suffer, says the work above quoted, are the sailors and poor close to the Elbe; then, when a large number of them are dead or ill, the infection is carried from man to man into other parts of the town. Thus direct contagion is made to account entirely for the spread of the disease. There is not a suggestion that the waters from the filters might be incompletely purified, although it is clear from close examination that in 1876, as now, the apparatus for filtration was not adequate, was not placed at the general disposal of the town, and besides did not promise such adequate filtration from organic impurity as its projectors professed it could give.

TRIBUTARY STREAMS AND LOCAL SUPPLIES.

Besides the "water supply" of the city, in the official sense of the term, we may consider the total supply of water procurable in any way, whether from nature direct or from local sources. Dr. Wibel wrote an exhaustive monograph on the river and surface water of Hamburg in 1876. The three rivers in the immediate vicinity of the city are the Elbe, Bille and Alster. The analysis of water taken from the middle of the Elbe showed that Elbe water was not different in composition from that of any other river similar in its source, length and course. The tourist who has visited the beautiful district near Dresden known as the Saxon Switzerland, is aware that the Elbe, as it flows by Schandau and Pirna, far from the great city near its mouth, is already a very dirty river; and even at Leitmeritz in Bohemia, the narrow rapid "Elbestrom" is as muddy as the Mississippi. Nobody would care to drink it there. At Hamburg it is of course much worse. The Bille is a small stream which flows from the woods where once our Saxon ancestors dwelt. Dr. Wibel shows that in the suburbs of Hamburg it is fairly pure. But near its entry into the Elbe within the city, it is thoroughly polluted, and full of all sorts of organic substances. The Alster arises in Holstein, and enters the Elbe after dilating, on account of artificial impediments, into the famous "outer and inner Alster," which are among the "lions" of Hamburg, and give a characteristic appearance to the city. The analytical tables show that the Alster is not nearly so polluted as the other rivers; probably its two great ponds, used for boating and skating, are not so near low quarters and housewives with pails and dustbin produce as are the Elbe and Bille. Unfortunately, there flows into the outer Alster a stream of notorious ill fame, the Eilbeck, which neutralizes much of the advantage that the Alster may gain from the kind of protection above referred to. The Eilbeck flows through the town of Wandsbeck in Holstein, and before opening into the Alster it spreads out as a pond known as the Kuhmühlenteich. The Eilbeck was tried and found guilty in 1874 of having caused an epidemic of typhoid in a district through which it flows.

CANALIZATION AND POLLUTION.—SURFACE WELLS AND PUMPS—POSSIBILITY OF ARTESIAN WELLS.

Hamburg once had the great advantage of a large number of running streams of pure drinkable water. Hence, no doubt, in past centuries, when the hygiene of the town was otherwise far worse than at present, the citizens escaped dangers to which their living descendants are now exposed. The extensive canalization of Hamburg has entirely destroyed many of these streams. Only four remain, and three are thoroughly polluted, running through dirty slums; one of them receives the drainage of the main cemetery. The fourth, the "Englischer Brunner," is less noxious. This pollution of bright streams is a sad affair and their restitution to their pristine purity a theme worthy of the consideration of sanitarians. Dr. Wibel notes that the ease with which water can be obtained from the waterworks supply has caused the good old fashion of drawing water from these streams outside the town to die out. Our surprise about the prevalence of cholera will be much allayed when we find that Dr. Wibel analyzed the brook water from certain pumps close to the streams. Out of the pumps much evil must be drawn. The pumps properly so-called, drawing surface water and not water from the rivers or streams, are next considered. Their water is condemned and yet some of them are specially used for table purposes, A few surface water ponds with drains exist in the neighborhood of the city; of course, they are polluted. Lastly, Dr. Wibel describes his researches respecting the artesian wells of which it appears, there are ten at the disposal of the city. The water is fairly pure, but as it flows in different wells through different strata it varies greatly in chemical composition; in some cases it is highly charged with soluble inorganic salts. It is not satisfactory to find that Dr. Wibel does not consider that it is an easy matter to discover fresh artesian wells. There is no known indication for calculating where they can be pierced so as to reach water at a safe depth without great cost and difficulty.

ARTESIAN WELLS AND SAND FILTERS.

The mention of artesian wells in relation to Hamburg renders it necessary that all who take a real interest in the restitution of that city to a sanitary condition should remember precisely what an artesian well is, and how it is made. It is a spring of water rising above the surface of the ground by natural hydrostatic pressure as the result of the boring of a small hole down through a series of strata to a water carrying bed enclosed between two impervious layers. In the first place, the difficulty of boring a small hole through a great depth of strata varying in density is considerable, and the expense high. The boring is always more or less experimental; the precise position of subterranean water is not always to be determined. Sometimes the boring need be but about 300 feet, as in many English wells; at others 3,000 or even 4,000 feet are exceeded. Then the boring may strike water lying between two impermeable strata; but there may be a flaw in one of the strata, or the lower may be damaged by boring too far. In both cases the water will not rise, as it escapes through the flaw or sinks below the lower impermeable stratum running through the boring into porous soil beneath. In boring a well at St. Louis, Mo., in 1868, water was found at the depth of

3,147 feet, but it proved to be brine. Hence minute precautions must be taken else all the engineer's labor may be in vain. Boring too many wells close together prevents the water from rising to the surface, so that pumps have to be used. To cry out for artesian wells at once is like demanding the instant building and equipment of ironclads when the foe is near the coast. The boring of the wells is a necessary prophylactic duty which the authorities must deliberately, but not hurriedly undertake. As for shallow wells, digging for them is out of the question, as they are never to be tolerated in a porous soil—as at Hamburg—on which houses are built. The best bricking in of the sides can not protect them from impurities entering from above and below.

For understanding sand filter beds much knowledge of sanitary engineering is demanded. But in relation to their failure at Hamburg, it is interesting to know how they may fail. In the filter beds the bottom is paved, then layers of clean material are spread, decreasing in coarseness from small rubble to sharp sand, with a total average thickness of about four feet. The actual filtration is effected by the upper layer of sand, and the lower layers allow the passage of the water unaccompanied by the sand. The efficiency of the filtration depends upon the slowness of the passage of the water; sometimes defects may cause the water to flow too fast. The top layer of sand soon becomes choked with the matter removed from the water. Hence the filter must periodically be cleaned by scraping off the top surface of the sand. Thus it is easy to understand that a filter bed may be faulty and is easily mismanaged.

During the months which immediately followed the epidemic of 1892, provision was made for an additional water supply, in case of need, pending the completion of the improvements which are being carried out in connection with the present waterworks. This provisional supply consists of 56 public wells, 34 useful private wells, 43 stations for boiling river water and 126 connecting taps with the Altona and Wandsbeck systems. There are also 98 water carts for the distribution of this water, and 6 water boats to supply the shipping interests. A few of these wells were in use before the epidemic broke out, but most of them have been opened since that time. During the past few months at least 127 wells have been bored at the public expense, but only 39 of them have been found to furnish a useful water. More wells are being sunk. The popularity of the stations for boiling river water may be judged from the fact that several of the stations are visited by upwards of 1,400 people a day. The improvements which are nearing completion at the waterworks consist of 4 large subsiding basins and 18 filtering beds, on the principle of downward filtration through fine sand. The water will be taken from a point 2.4 kilometres further up stream than at present. The subsiding basins will have a capacity of 78,500 cubic metres each and the water will be allowed to settle 21 hours before it is drawn off into the filtering beds. The filters are 18 large rectangular open basins, built of brick and cement on a clay base; each basin has a surface of 7,500 square metres, and a capacity furnishing 11,250 cubic metres of water per day, at a filtering rapidity of 62.5 millimetres per hour. The filter consists of a layer of sand 1 metre in thickness, spread over a layer of gravel and stone, which is 0.6 metres in thickness.

WATERBORNE CHOLERA IN INDIA.

India is very generally referred to as the "home of cholera." The disease is there established endemically throughout a wide area, but not, as most Indian authorities once believed and many would even now apparently often have us believe, in virtue of any local, mysterious, unknown or unpreventable causes. It is so in virtue of conditions which may all of them be removed and which in time I trust will be removed. In 1879 there were 318,000 deaths from cholera in India; in 1881 there were 161,000 deaths; in 1887 488,000; and in 1888, 270,000. It must also be admitted that nearly all the great cholera epidemics can readily be traced back to India along lines of human intercourse. But what to my mind is entirely contrary to all we know of cholera, and is, from a practical common sense point of view, much to be deprecated, is the tendency in many quarters to regard the idea of eradicating cholera from India as impossible and ridiculous. I have waded through and studied, I think, all the reports and available information respecting India during the last thirty years, and have had the benefit of much personal converse on the subject with medical men who have spent years of their life in the "endemic area" of India, and in the result, it seems to me as fatuous to deny the possibility of ridding that "endemic area" of cholera, as to deny the possibility of banishing typhoid fever from unwholesome localities in this country. I do not question the herculean nature of the task. The religious rites and superstitions prevailing in India, the ignorance and fanaticism of the natives, the enormous expenditure requisite may all combine to render the difficulties of the task well nigh insurmountable in present circumstances. But let it be rationally realized that an endemic area of cholera in India is a removable blot, and let those who are responsible for the government of India set to work to remove the food on which cholera grows, and in time to starve the scourge out of India. For my own part I am convinced that in India as elsewhere, water has been the chief nurse and disseminator of cholera, and that if every town and village in India were provided with pure and properly protected water the so-called endemic area would soon become indefinite, and would eventually disappear from the map. Why there should have been so much opposition to this contention, such needless straining to prove it groundless or to shake its foundation I am somewhat at a loss to understand. It is a fact that cholera, to all intents and purposes, fled from Madras and numerous other places immediately on the introduction of uncontaminated and properly protected water. Why should not the experiment which when tried has always been found successful, have been extended or, at least, further tested in new localities? Happily, with the support of such eminent and practical Indian sanitarians as Drs. Macnamara, Townsend, De Renzy, Cornish, Payne, Simpson, Furnell and Laurie the contention that water is a frequent and common means of cholera diffusion in India is gaining ground, and must ere long bear good fruit.

Dr. M. C. Furnell, in his recent excellent book on the subject expresses himself as firmly of opinion that the general method of the propagation of cholera in India is by means of specifically polluted water. While in Europe, however, nearly every outbreak of cholera has been definitely traced to the contamina-

tion of the water supply, and much has been written about it, telluric and atmospheric conditions are distantly invoked by Indian authorities. These are terms of mystery and of indefinite meaning, which unfortunately have been adopted, however, by too many government officials, who can not explain what they mean, and frequently use them as a cloak for ignorance. Dr. Furnell has had no difficulty in finding masses of facts in support of his opinions. The habits of the natives, though in direct opposition to their own laws and sacred writings, are such as tend to the most filthy pollution of the water supplied for their use. Where pure water has been supplied to to the natives, as in Madras and Calcutta, and care has been taken to guard such sources of supply from pollution, cholera epidemics have become of infrequent occurrence and of greatly reduced fatality. In this opinion all the best authorities concur.

I will refer to the two great cities which are leading seats of government and most under our influence. In the paper by Dr. W. J. Simpson, medical officer of health, read at the British Medical Association in August, 1888, he gave a description of Calcutta, Howrah and the suburbs, dwelling especially on the water supply, the tanks, the drainage, the construction of the streets and houses, native and European; and the sanitary system generally. Calcutta, to the south of the native town, he stated is well built; the streets are wide and straight, the houses are large and have gardens attached; there is a liberal supply of excellent water, the drainage and cleansing are good, and that portion of the city compares favorably with the better parts of London. With a few exceptions, northern and native Calcutta is densely crowded, the streets are narrow and irregular, the drainage is bad, only the better and middle class have a fair supply of water; the poorer class have a very scanty water supply, and depend upon the water in the tanks. The native town is studded with wells and tanks. Neither Howrah with its 100,000 inhabitants, nor the suburbs of Calcutta with its 250,000 have any public water supply, with the exception of the wells and tanks. The insanitary condition of Howrah without a public water supply, and without building regulations is surpassed by the suburbs, which have no public water supply, no drainage, no building regulations, nor any effective conservancy arrangements. As a general rule, European residents in Howrah get their water from Calcutta by carriers, and they avoid the well and tank water. The personal habits of the natives are cleanly. As a religious duty they bathe at least once a day, the women more frequently, and this is done when convenient, in the river Hooghly, but generally in the tanks near their houses or huts. The tanks are thus defiled by the excretions of the body, by the washing of dirty clothes, frequently of clothes soiled by excretions of the sick, by human ordure due to the practice of children and others defecating on the banks of the tanks, and by the drainage and soakage from the surrounding huts and houses. Thus the water in the tanks except during the rainy season, varies in quality from moderately polluted up to concentrated sewage, and this is the only water supply practically available for large numbers of the native population. Dr. Simpson traces out the connection between local outbreaks of cholera and a deficient and contaminated water supply, showing that those who have an abundant and pure water supply—namely, the European and better class of natives—escape cholera epidemics, except in isolated instances, which can generally be accounted for; while the natives who necessarily depend on the tank water, suffer severely when the tank becomes polluted by the excreta from a cholera patient. He says:

"I would particularly direct attention to this scarcity of water in the parts affected. Go almost where one may, in the northern part of the town, and especially in the riparian wards, there is the same complaint of the want of water, and a very valid one it is. It is a common occurrence to see the people grouped round one of the standposts, waiting their turn to fill their chatties, many of them to be disappointed, for the water from the standposts often comes in mere driblets, and the supply is exhausted or turned off before half the people are supplied. Scarcity of water brings in its train a great deal of sickness apart from cholera. The districts which have suffered most from scarcity of water have suffered also from a large amount of sickness of a dysenteric character."

The natives bathe, wash their utensils and clothes in the tanks, because it is the only available place for doing so; and they use the water of the tanks, contaminated in addition by soakage and sewage for cooking and drinking, because it is the only available water supply for domestic purposes. The remedies for the condition of affairs described are simple enough but they need time, and must involve considerable expense. The first requisite is a liberal water supply for Howrah and the suburbs, and a more liberal supply for Calcutta. Few will drink polluted water if they can obtain pure water. By specially constructed tanks even the habits of the people can be so directed as to permit them to enjoy the luxury of the bath, and to perform their ablutions without danger. The second requisite is well-planned streets with free ventilation, good building arrangements, a system of drainage to pass through these streets, systematic clearing, leveling, paving and filling up ponds, draining, scavenging, removal of nuisance, and a well-organized sanitary department. The carrying out of these measures will ultimately convert Calcutta, Howrah and the suburbs containing nearly 800,000 inhabitants, into as healthy a locality as any in the world, in so far as the prevalence of diseases not due directly to a subtropical climate is concerned, and these measures of sanitation will change one of the most important centers in the endemic area of cholera into an area no longer marked by endemicity. Before any real progress in scientific medicine can be expected in India, the scientific branch of the medical service must be distinct from the administration, for when administrative functions preponderate, scientific research is relegated to such a subordinate position as to render it impossible to be carried out satisfactorily. A central institute is necessary, well-equipped, and having attached to it a body of men well trained in chemical, physiological, and biological methods, whose whole time should be devoted to scientific research.

I take another example from Dr. Furnell, the surgeon-general at Madras, writing in 1886 an address on cholera. For many years before the introduction of the Red Hills water supply into Madras, the number of deaths from cholera annually amounted to

hundreds, and too frequently to thousands; but from the year 1872, when the water supply was first opened, there has been a very large reduction in the mortality, one year being absolutely free from the disease, and in three others the deaths being 5, 6 and 2 respectively. Of course during the famine years there was a large increase in the fatal cases of cholera, caused by the migration into the town of many poor, half-starved creatures who had no strength left to resist the disease. But as soon as the famine was over the rate of mortality again fell to below 100 per annum; and during the last four years when there has been a severe epidemic of the disease throughout the greater part of the Madras presidency, the average number of deaths had not exceeded 250 per annum. The greater part of these deaths also, it is shown, took place in those parts of the town which had not had the benefit of the Red Hills water supply. Dr. Furnell, therefore, urges the necessity of extending the water supply to these localities. Our duty, then, lies before us; it is a grave and difficult task, but must be looked steadily in the face.

From Dr. Furnell, also, I gather that Pondicherry has a similar immunity from cholera, even while the disease is raging in the neighboring English towns of Cuddalore, Chellumbrum, etc. Pondicherry town is supplied with water by artesian wells and also from a small lake situated some distance outside the town, from whence the water is led by pipes and distributed throughout the town. It is impossible to contaminate the source of the artesian wells, and great care is taken that the other source is also protected. To this unique water supply Dr. Furnell has attributed the immunity of Pondicherry from cholera. "If it is argued," he says, "that it is more likely owing to its general cleanliness and conservancy, I answer that while all must admit Pondicherry is a clean town (in that respect an example), still I can not admit that it is so much cleaner than the neighboring town of Cuddalore, where cholera flourished with much vigor; nor can I admit the difference is owing to telluric, atmosphere or local influences, for to tell the truth these terms convey no very definite ideas to my mind, and seem rather a convenient escape from ignorance than from any scientific explanation. But why, one may ask, should a certain spot in a contaminated district thus suddenly be exempt from these mysterious influences? Its unique water supply, free from contamination, seems to me a much more common-sense explanation of the matter."

Here is another instance quoted by Dr. Furnell of the protection afforded to a community by a pure and uncontaminated water supply. It is Dr. Van Geyzel of Ganjam, who thus describes it: "The port of Gopaulpore (Ganjam district) has enjoyed a remarkable immunity from epidemic cholera under circumstances which are sometimes considered very favorable to the spread of the disease. Cholera has this year (1885) raged all over the district, from Rumbha to Chicacole, and from east to west; the villages in the neighborhood of Gopaulpore furnished not a small proportion of cases. When it is remembered that from these very villages hundreds of coolies go daily to Gopaulpore for work, and back again; that a stream of carts, about 150 on an average, keeps daily pouring into Gopaulpore from various parts of the district and out again, it goes without saying that Gopaulpore is by no means isolated in any way, but on the contrary, it has as frequent and large a communication with the interior parts of the district as Aska or Rumbha, or even Berhampore, in all of which places it may be said that cholera is very seldom absent. During this year only three cases of cholera occurred in Gopaulpore. These cases arrived already suffering from the disease. In this way the disease has occurred, now and again, chiefly among people coming from other places, but it has not gained a foothold. The general sanitary condition of Gopaulpore, though much improved of late, is by no means what is to be desired. There is, however, one circumstance which makes Gopaulpore unique in respect of its water supply; it has absolutely no tanks whatever. There are thirty-five wells in the village for a population of 2,675 people, good, bad and indifferent. Lately some wells have been sunk by Mr. Minchin, who generously allows people to take drinking water from them, and they are freely resorted to. The immunity of Gopaulpore from epidemics of cholera while it was surrounded by infected villages with which abundant daily communication took place, as well as with other and more remote parts of the district, especially at a time when cholera was raging epidemically generally over the whole district, and the inability of the disease to establish itself, although it was imported on many occasions, point to the want of something by which the disease could be propagated and spread. In this connection the absolute absence of tanks is well worthy of note."

A further example of the influence of the water supply upon cholera in India is furnished by the 85,000 inhabitants of the city of Nagpur, the capital or chief city of the Central provinces. In 1872 that city was supplied from the "Ambaghiri reservoir." In the seven years previous to the opening of this water supply there were 1,264 deaths from cholera, while in the next seven years after that date Nagpur had only 177 deaths from that disease. It has been further remarked in Nagpur that after the opening of the water supply the cholera was limited almost exclusively to that part of the city in which impure water was still used, such as that of surface streams and open tanks.

The following interesting account of a cholera epidemic in the Salem district, in 1881, is extracted from the annual report of the sanitary commissioner of Madras for that year. It appears that by far the greater number of deaths occurred among people using the river water which is described as defiled by the filth from drains, the filth from dirty clothes, and the filth from men's bodies. It appears also that more than five-sevenths of the whole number attacked occurred among caste Hindus, people who obstinately cling to the use of this river water from religious belief. The Mussulman population almost escaped; the European and East Indian entirely; and strangest of all, the inhabitants of Kitchipoliem, Chucklers, low caste people who are engaged in most filthy occupations, and who are not allowed to use the river water, also enjoyed an immunity from this dread scourge. The course of the disease is shown to have been mainly along the banks of the river, and the village of Kitchipoliem, mentioned as having enjoyed an immunity from the disease, is situated well away from the river. That the use of the river water alone is not to be justly saddled as the cause

of the disease, is evidenced by the statement that the division of the town in which the inhabitants used well water instead of that of the river suffered as severely from cholera as most of the other parts of the town along the river banks. Apart from all this it is added: "The curious feature of the epidemic is its weighty incidence on children, nearly one-half of those attacked being children under 15 years of age, and fully one-half of the deaths occurring among them."

Again, in the Punjab sanitary report for 1869 Surgeon Major A. C. De Renzy called attention to the remarkable fact that the Fort of Peshawar had passed almost unscathed from the terrible epidemics which had visited that station, and that this immunity was the more remarkable because the fort was extremely unhealthy. Dr. De Renzy attributed the circumstance to the fact that the fort was supplied with water from a well which, though an extremely bad one, was more safe from choleraic contamination than the roadside gutter water so generally used in the cantonment. On visiting Peshawar in company with Dr. Cuningham a few years later Dr. De Renzy was surprised to find that the European troops in the fort had suffered with special severity and for a time he doubted the correctness of his own explanation. But casually and after some days the novelty of an epidemic in the fort became less inexplicable. It appeared that about a week before the appearance of cholera at Peshawar the medical officer of the fort seeing how bad was the fort water and how much the troops were suffering from fever, and not knowing anything of what Dr. De Renzy had written about the immunity of the fort from cholera, had recommended the supply of cantonment water, and this water was accordingly sent in casks, the distance being about two miles. The water was supposed to be taken, as ordered, from a certain good well, but it seems that in one case at least, the water carriers, to save themselves the trouble of lifting water by means of ropes and pulley blocks from a depth of 90 feet, had filled their vessels from the roadside gutters. Whether they did so or not in the case under consideration is unknown, but the fact remains that in 1872 for the first time in the history of the fort, the European troops were supplied with cantonment water, and that this was also the first occasion of their being affected with cholera. The native portion of the garrison continued to use the well water as formerly and enjoyed their former immunity from the disease.

Religious pilgrimages are a fruitful means of spreading cholera in the east. In 1866, 30,000 pilgrims died of cholera at Mecca. And here let me mention one of the customs of that pilgrimage which goes far to explain the intensity and the fearful mortality which attend any outbreak of cholera among the Meccan pilgrims. At a given period the pilgrims stand naked in turn by the holy well; a bucket of water is poured over each man; he drinks what he can of it, and the rest falls back into the well. The water of this well has been analyzed by an English chemist, Dr. Frankland; it is fearfully polluted with abominable contaminations. In 1866, within a few days of the ceremony, the road for twelve miles to the foot of Mount Ararat was thickly strewn with dead bodies.

In a report in June, 1891, Dr. W. J. Simpson, an able and energetic health officer of Calcutta, gave an interesting account of two large pilgrimages which he personally witnessed in that year—one in the endemic area of Bengal and the other in the non-endemic area or north part of India. The first of these pilgrimages was the Ardhodoya Jog, which is held at Calcutta and other sacred places near Calcutta, at rare intervals of 27 or 28 years. The purity to be obtained by bathing in the Ganges during this festival is exceptionally great, and therefore the gathering of pilgrims at the several bathing shrines was, on its own merits, a very large one. Kalighat, where the gathering in question took place, is in the suburban area of Calcutta, on Tolly's Nulla, a small tidal creek which is held to be more sacred than the Hooghly. The Nulla can be waded across at low tide, but it is the receptacle of unspeakable filth of all kinds. After describing the insanitary arrangements of the neighborhood, Dr. Simpson remarks that "without a good water supply, or drainage, or proper means of disposal of the excreta and sulliage, with crowding together of huts and houses irregularly placed, and with the filthy tidal Nulla, which is practically the sewer of the district, and with numerous polluted tanks, Kalighat, it may be surmised, is at no time a healthy spot, and at all times a danger to pilgrims." On the occasion in question at least 150,000 people came into Calcutta in the first and second week of February, and to describe the crowding which occurred in the Nulla on the festival day is difficult. Dr. Simpson performs this task very graphically by appending to his report a photograph which he himself took on the morning of February 8. The crush is seen to be very great, and it is marvelous that no accidents happened; the tide is low, and the bathers, even in mid stream, have not the water much above their knees. A collection of boats, extending as far as one can see, is so great and close together that only occasional glimpses of the water are to be obtained, and these boats are crowded with men, women and children. Dr. Simpson gives details of an outbreak of cholera which occurred among these people, as many as 51 cases appearing on February 11. The pilgrims had to be soon dispersed, and though this dispersal checked a larger outbreak at Kalighat which would have only widened its circle afterwards, it could not prevent those already infected from suffering on their way home. Consequently, at some of the principal railway stations sick people had to be taken out of the trains; passengers by boat died on their voyage, their bodies being thrown overboard; while travelers on foot were picked up dying and dead on the roads.

Dr. Simpson's description of the great Kumb festival, which occurs once in twelve years at Hurdwar, is also very graphic, and photographs taken by Dr. Simpson at the festival of 1891—copies of which I have before me—show the sacred pools and the approaches to them to be hidden by a mass of semi-naked human beings. The pollutions to which the sacred pool is exposed on these occasions are indescribable. There is not only the washing of the naked fakirs who cover themselves with wood ashes as their only clothing, and the general bathing of the pilgrims, who are not all in the cleanest of clothes —several, moreover, on the occasion in question being seen bathing with skin diseases upon them—but the ashes of deceased relatives, enclosed in little red bags, are brought from the different homes of

the pilgrims and thrown into the pool. Can it be wondered at that, when cholera cases have been among the pilgrims, disease and death should have spread broadcast?

Reverting again to the sanitary administrations of India and the dfficulties to be encountered, I fully recognize that very much has been done in the way of sanitary reform under English rule. This was shown by Surgeon General Sir W. Moore, in an interesting paper read by him before the International Congress of Hygiene, which met in London in 1891; but at the same congress the authors of numerous other papers showed the amount of sanitary work still urgently waiting to be done in India. One and all of those authors placed the need for better water as the most pressing want throughout India, especially in the villages, which contain 95 per cent. of the people of India.

Greater energy and more systematic administration are much needed in regard to the sanitation of India, and England's imperial responsibilities in this matter are very heavy, not only to the native races under her protection, but to civilization at large. At the International Hygienic Congress in Vienna, the remark was constantly made, "You English have by your sanitary improvements prevented cholera from gaining a foothold in England; why do you not attack it in its birthplace, and prevent it from springing into life in India?" And the same question has more recently been asked by Dr. Talafuss of Tiflis, and by M. Monod, the director of the public health department of the French Ministry of the interior, in his work on Cholera in Finistère. We may well closely question ourselves why we have not succeeded in carrying further than we have done the great work of improving the sanitary circumstances of Indian populations. It has not been, as Sir Douglas Galton has pointed out, for want of knowledge. The following scheme for a new public health service for India has been drawn up by an eminent medical officer in India, who has himself long been engaged in sanitary work and organization. I commend it as a useful suggestion to our Indian government:

1. An imperial sanitary department attached to the government of India.

2. A provincial sanitary department attached to each of the provincial governments, such as Bengal, N. W. Provinces, Punjab, Madras, Bombay, Central Provinces, etc.

3. A local sanitary department attached to each municipality, district board, etc.

1. The imperial sanitary department should be administrative and scientific, and quite distinct from the sanitary department of the army. It should consist of: 1, the sanitary commissioner with the government of India; 2, deputy sanitary commissioner; 3, a medical statist; 4, veterinary commissioner; 5, sanitary engineer; 6, a minister of health, having a seat in viceroy's council as president. Scientific agents: Laboratory with trained experts. Duties: The advising of the viceroy and council on important health matters, either initiated by the imperial sanitary department or referred to it by the local governments; the collection and publication of information as to epidemic disease existing in India and in other countries; the right of asking from provincial governments what they propose to do or have done in checking or inquiring into diseases affecting man, animals or agriculture in their provinces; the arranging that all administration reports shall be drawn up on a uniform plan for ready reference; the acquiring of all information regarding the movements of pilgrims, coolies and emigrants, and the advising the provincial government, and requiring the latter to take proper precautions; the consideration of new sanitary laws, etc.

2. Provincial department, to consist of the following sanitary officers appointed by the local government: 1, sanitary commissioner; 2, assistant sanitary commissioner; 3, sanitary engineer; 4, a president, who should be a high officer in the civil service. Traveling agents: Deputy sanitary commissioners or inspectors, veterinary surgeons, deputy sanitary engineers, as may be required. Scientific agents: Trained professors and assistants in government laboratory for bacteriological, chemical, agricultural work, etc., and general sanitary investigations requiring to be done in laboratory. Duties: To control local authorities; to institute special investigations at any particular spot on any particular subject; to make by-laws and amend sanitary laws; to investigate diseases of men and animals, and study agricultural pests, etc.; to analyze waters, etc.

3. Local sanitary departments, to consist of municipal commissioners or district magistrates, with civil surgeon when obtainable. Executive agents: A health officer, attached for one or more towns; an engineer in similar position, and a sanitary staff for each place as required. Duties: Conservancy, water supply, building regulations, drainage, registration of births and deaths, vaccination, stamping out of infectious disease and informing provincial authority by weekly reports as to prevalence of cholera, small-pox or other dangerous disease.

ADDRESS ON STATE MEDICINE.

Delivered before the American Medical Association at the Forty-fourth annual meeting held at Milwaukee, June, 1893.

BY WALTER WYMAN, A.M., M.D.

SUPERVISING SURGEON-GENERAL OF UNITED STATES MARINE HOSPITAL SERVICE.

THE EXTINCTION OF CONTAGIOUS DISEASES.

Mr. President, Ladies and Gentlemen:—Is the idea utopian or has the time come in the history of the world when it should be considered a rational thought, worthy of serious contemplation? When a standard so lofty as this should be raised, and around it gather physicians, sanitarians and philanthropists fully determined upon a great struggle and animated by a reasonable confidence in ultimate success?

Concerning the *great epidemic* diseases, encouragement may be found both by a reasoning from analogy, in the study of their respective histories, and in the contemplation of modern knowledge and methods.

The history of the world shows us that whole races of men and other animals have become extinct. Why should not races of microbes become extinct? And certain diseases that once ravished the earth in epidemic form have so lost their inherent strength or have been so controlled in the latter part of the nineteenth century as to warrant the belief that their histories are closed, or fast closing. The plague of Athens and the plague of the second century are unknown at the present time; and the terrible black death of the fourteenth century it is unreasonable to

suppose can ever again sweep from the face of the earth 25,000,000 of its inhabitants within a century.

The terrible bubonic plague since the introduction of quarantine, crude though the first quarantines were, has gradually receded from Europe, its last appearance on European soil being in 1878 when the Russian government by means of military cordons and destruction of infected villages by fire succeeded in stamping it out. Though it still occurs in Asia it may never again obtain a serious foothold in Europe because of more perfect quarantine and improved sanitation.

With regard to yellow fever the *great* period of *its* history was from 1732 to 1805. Formerly it was of common occurrence in Europe, the ports of Spain in particular suffering severely between 1801 and 1825, but there has been no disastrous epidemic of this disease in Europe since that of Lisbon in 1857, thirty-six years ago.

Its earlier history in this country includes invasion not only of the South, but of parts as far north as Pennsylvania, New Jersey, New York and even New Hampshire. But to-day, though constant vigilance against its introduction is necessary, it has practically vanished from the ports of the United States.

Formerly epidemics of this disease were so frequent in the city of New Orleans that the belief became quite prevalent that it was natural to the soil, but under the excellent quarantine service, and the modern quarantine appliances of the Louisiana State Board of Health, there is now a record of fourteen years' exemption from this dreaded pestilence. The last epidemic in the United States was that in Florida in 1888, when, by reason of intelligent restraints, it was prevented from spreading to other States. Since that date an efficient State Board of Health for Florida has been established, and under its vigorous management the disease has been barred out. Even in the West Indies some ports formerly affected are now exempt and with careful sanitation and sanitary engineering all might be freed, and this dread disease become as certainly a matter of history only, as the African slave trade with which it was intimately associated. In South America, Rio Janeiro is its principal breeding place, but the disease was unknown there until 1849. Why should it not again become unknown?

Since the discovery of vaccination by Jenner in 1796 small-pox, though still a stubborn foe, no longer devastates without restraint. It is now simply a matter of choice whether one shall be made absolutely proof against this disease, and the good effects of a compulsory law regarding vaccination are seen in the statistics of Prussia, in which country for six years prior to the enforcement of vaccination the deaths from small-pox averaged 85 per 100,000 of the inhabitants, while from 1875 to 1886, after the law came into force, the yearly average was but 2 per 100,000.

Typhus fever flourishes to-day in certain parts of Mexico, and is occasionally reported from the old world. It is always a menace where large numbers of people are crowded together with unsanitary surroundings. But it has no permanent lodgment in the United States, and the energetic and successful measures instituted by the Board of Health of New York during the past winter to suppress this disease, although it appeared in a section of the city more densely populated than that of any other city in the world, is a striking example of what may be accomplished by proper law, energetic execution and scientific disinfection.

The Japanese have recently illustrated how a disease, commonly thought to be infectious, may be eliminated by scientific investigation and the application of a proper remedy. Prior to 1884, beriberi was the scourge of the Japanese navy. During a period of six years prior to 1884 there were 9,516 cases reported, while for a second period of six years, from 1884 to 1889 inclusive, there were but 765 cases, of which 718 occurred in 1884, which was the year in which the remedy, relating to a change in the character of the food furnished, was applied. In 1887 there was not a single case reported in the entire navy of 9,000 men; and the *New York Medical Record* aptly remarks that "this is one of the great victories of science, and lends good grounds to the hope that beriberi may before long become a rare or even unknown disease in the Mikado's dominions."

With regard to cholera, which is still an ever threatening menace, the history of the past few years has demonstrated most clearly its relation to filth and to contaminated food and water, both of which conditions require only the peculiar energy and love of cleanliness characteristic of the Anglo-Saxon race. In recent years the superior sanitation of England and the more perfect quarantine surveillance of the United States have served to protect these two nations from this exotic disease.

One possible agency in the elimination of these diseases, still young as a science but not without promise, is protective inoculation. Whatever opinion may be held of Freire's inoculations for yellow fever and Kitisato's and Haffkine's inoculations for cholera, the investigations of these and other bacteriologists in this particular field warrant the hope that results will be attained equal in efficiency to vaccination for variola. But be this as it may, the nature of these diseases is now so well known that they no longer strike terror in the hearts of those whose duty it is to meet and combat them, and never before has human agency had within its grasp the weapons known to be efficient in preventing their spread. The terra incognitus no longer exists, and we have but to provide ourselves with the weapons, and manifest the energy to wield them, to combat successfully these microbic armies hostile to human life. As to the *United States* the time is at hand when we may expect that no more shall cholera, typhus, yellow fever or small-pox prevail in epidemic form. Never before have our ports been provided, as now, with protective armaments; the ordnance, so to speak, of sanitary defense. The great power of steam has been invoked, and along the coast from Portland, Maine, to Port Townsend, Washington, where ten years ago not a single port was provided with a steam disinfecting chamber, there are now twenty-three ports with steam chambers in actual operation or in course of construction. These ports are: Portland, Boston, New York, Sandy Hook, Delaware Breakwater, Reedy Island in the Delaware River, Cape Charles, Baltimore, Wilmington, N. C., Savannah, Blackbeard Island, Ga., Charleston, Dry Tortugas, Key West, Mullet Keys, Pensacola, Mobile, Chandeleur Islands, New Orleans, Galveston, San Diego, San Francisco and Port Townsend; of these ten are national quarantine stations.

In *support* of the quarantine plants are *laws* both

national and State, that are sufficient; but should perchance contagion pass this line, it meets with forces ready to prevent its spread. State boards of health have increased in number and in power. There are now thirty-seven, and at their recent conference in New York City, the reports revealed not only their zeal and activity, but an increase in the legal power and pecuniary resources of many, brought about by their own efforts within the past year. In States that have no board of health, or for other reasons fail to execute such regulations as are necessary to prevent the spread of epidemic disease into adjoining States, the government, in the interest of all, under the act of Congress of February 15, 1893, must undertake to enforce them.

QUARANTINE LAW AND REGULATION.

It will be germane to the subject and may be of particular interest at this time, to give a resume of the measures which have been taken by the national government under the act referred to. This act, approved February 15, 1893, is entitled "An Act granting additional quarantine powers and imposing additional duties upon the Marine Hospital Service." Stripped of its legal verbiage it provides, first, that no vessel shall enter a port of the United States from a foreign port without a bill of health, signed by the United States consul, or a medical officer of the United States government; and provides a penalty of $5,000 to be imposed on any vessel coming into American waters without such bill of health. Furthermore, the vessel shall not be admitted to entry except in accordance with other provisions of the act, and with such regulations of State and municipal authorities as may be made consistently therewith; and before being permitted to enter or discharge its cargo or land its passengers a certificate must be obtained from the health officer at the quarantine station, certifying that the rules and regulations have in all respects been complied with, both on his part and on the part of said vessel and its master. This bill of health and the quarantine certificate are to be delivered to the collector of customs.

The secretary of the treasury is directed to make rules and regulations to be observed by vessels at ports of departure and on the voyage, and the president may detail a medical officer of the government to serve in the office of the consul at any foreign port for the purpose of making the necessary inspection of vessels, to see that the regulations are complied with, to sign the bills of health and to furnish information.

Consular officers are required to be notified by the secretary of the treasury of the regulations made with regard to vessels, cargoes, passengers and crew at ports of departure and on the voyage; and of the regulations also to be observed in the inspection and treatment of vessels on arrival at ports of destination in the United States. The supervising surgeon general of the marine hospital service is required to examine the quarantine regulations of all State and municipal boards of health, and at ports or places which are found to have no quarantine regulations under State or municipal authority, where such regulations are, in the opinion of the secretary of the treasury, necessary, and at ports or places where State or municipal regulations exist, which, in the opinion of the secretary are not efficient, the secretary is empowered to make additional rules which after being promulgated, are to be enforced by the sanitary authorities of the States and municipalities if they will undertake to execute and enforce them, but if said authorities refuse or fail, the president shall adopt such measures as are necessary to their enforcement.

The law further specifies that it shall be the duty of the supervising surgeon general of the marine hospital service, under the direction of the secretary of the treasury to perform all the duties in respect to quarantine and quarantine regulations which are provided for by this act.

It further provides that information shall be obtained of the sanitary condition of foreign ports and places through the consular officers of the United States; that weekly reports shall be obtained of the sanitary conditions of ports and places within the United States, and for the collection of such other information affecting climatic and other conditions of the public health as may be pertinent. Weekly extracts of the consular and other sanitary reports are to be prepared and published, and transmitted to the collectors of customs, State and municipal health officers and other sanitarians. The law further permits the secretary of the treasury to remand an infected vessel from any port, which is not provided with proper facilities, to the nearest national or other quarantine station, and after treatment at a national quarantine station, with a certificate furnished by the United States quarantine officer, a vessel shall be admitted to entry at any port of the United States named in the certificate. But at ports where sufficient quarantine provision has been made by State or local authorities, the secretary of the treasury may direct vessels bound to said ports to undergo quarantine at said State or local station.

An important section of this act is that which gives the president the right to prohibit in whole or in part the introduction of persons and property from such countries or places as he shall designate, and for such period of time as he may deem necessary, whenever by reason of existence of cholera or other infectious or contagious disease in a foreign country there is serious danger of the introduction of the same into the United States, despite the quarantine defenses.

Provision is also made that if a State wishes to surrender the use of its quarantine buildings and disinfecting apparatus to the United States, the secretary of the treasury is authorized to receive them and pay a reasonable compensation to the State for their use.

The first step under this new law was the framing of regulations for vessels at foreign ports. To assist in this duty a board of medical officers of the marine hospital service was convened, and the regulations framed were approved by the secretary of the treasury February 24, and duly promulgated. These regulations prescribe the form of the bill of health; the definition of an infected port; what vessels shall be inspected before the bill of health is granted; the time and method of making the inspection, with all necessary details for the enforcement of cleanliness and perfect sanitation including disinfection, and relating both to the vessel itself and the cargo, crew and the passengers, both steerage and cabin. In ports infected with cholera, passengers of the cabin class must produce evidence as to abode during the

four days immediately preceding embarkation, and if necessary they and their baggage may be detained and the baggage subjected to such disinfection as is necessary. Steerage passengers in a cholera infected port, or from a cholera infected place must be detained five days under medical observation, and their personal effects and baggage must be disinfected by steam. The regulations further forbid the shipment of certain articles of bedding and clothing from an infected port, also certain articles of merchandise, such as old rags, old jute and old gunny, during the prevalence of an epidemic and for thirty days after it has been officially declared at an end. All rags at all times are to be disinfected before shipment to the United States.

Under the law these regulations are to be enforced at foreign ports, either by United States consuls, or by medical officers of the United States government, when said medical officers have been detailed by the president for that purpose.

An examination of the records shows that the chief ports of embarkation of the immigrants most liable to bring contagion are as follows:

Southampton, Liverpool, Hamburg, Bremen, Rotterdam, Amsterdam, Antwerp, Havre, Marseilles, Genoa and Naples. Accordingly a medical officer of the marine hospital service has been detailed by the president to serve in the office of the consul at each of the ports named. These officers have all had experience with ships, and with but two exceptions have had actual quarantine experience. They have been at their respective stations now for a period of two months, and their reports show both the necessity of their presence and the good results of their activity. This is a new departure in quarantine—quarantining in foreign lands—and the ultimate result may be looked for with great interest. Whatever the result may be, certain it is that the presence of these officers in European ports has diminished in a great degree the danger of introduction of cholera and other diseases from those ports. Their relations in one or two instances with the foreign governments were in danger of being strained, but this danger has been averted both by their tact and good judgment, and because of the all powerful United States law, which practically says to foreign officials that should they object to the official acts of these officers, the alternative is the refusal of the bill of health and the cutting off of all commerce between their ports and the United States.

For securing uniformity of action among these medical officers, and that the bureau may be informed as to any special difficulties in enforcing the regulations, an inspecting medical officer is now under detail, visiting each of these ports for the purpose named.

To aid these medical officers and the consuls in the performance of their duty a letter of instruction has been issued by the State department, addressed particularly to United States consuls at interior places in Europe and Asia, directing that when merchandise or immigrants are about to leave or have left, any section within their respective consulates where cholera prevails, they shall notify by telegraph the United States consul or medical officer at the seaport selected for embarkation that the officer may be prepared to enforce the detention and disinfection required.

On May 4 a circular was issued to consuls and medical officers, requiring all baggage of immigrants coming from any port to the United States to bear a label certifying to either inspection or disinfection. Furthermore, each immigrant is to be furnished with an inspection card giving his name, last residence, name of ship, port and date of departure and a reference number relating to the manifest which is required by the immigration regulations, and in which is contained much information regarding each immigrant. This card is to bear the stamp of the consulate. It is also to be stamped or punched at the quarantine at the port of arrival, and again at the immigration depot, and it is to be held by the immigrant until he reaches his point of destination. These inspection tickets, and the labels upon the baggage will furnish to the health officers of the interior States information which they have much desired with regard to immigrants coming within their borders. These provisions also insure care and accuracy on the part of medical officers and particularly on the part of United States consuls at ports where immigrants do not usually embark for the United States, but which may be sought by them in the hope of avoiding the enforcement of the stringent rules at ports where medical officers have been stationed.

For the vessel on the voyage certain rules have been promulgated relating to inspection and sanitation, isolation of the sick and requiring a clinical history by the ship surgeon of all cases of sickness to be delivered to the quarantine officer at the port of arrival.

Having thus detailed the precautionary measures set in operation abroad, I will now narrate briefly those which have been taken on this side of the Atlantic.

First I may refer to the danger which, for some time, seemed to be imminent by reason of immigration through Canada. The Canadian laws do not provide for the inspection and sanitation of ships and passengers at foreign ports, and it was feared on this account, there would be a large deflection of immigration to Canada. But owing to the public spirited policy of the Canadian government, and the energy and efficiency of the chief quarantine officer, Dr. Montozambert, the danger of introduction of cholera through Canada has been reduced to the lowest possible degree short of prohibition of immigration. All immigration into Canada is now via the St. Lawrence river. Forty miles below Quebec is statoned the Grosse Isle quarantine station, with perfect apparatus for scientific disinfection and accommodations for the sick and suspects. This station is reserved for infected vessels. Further up the river at Quebec, is the Louise Embankment, where is located a complete disinfecting plant; while at Point Levis, directly opposite, is located another. All immigrants, whether from infected or non-infected countries and though coming on non-infected vessels are obliged to undergo inspection at one of these two points, and all their baggage is disinfected by steam, the containers being washed with a solution of mercury. The disinfection is not one in name; but is thorough and complete. The Canadian government has very courteously assented to allow representatives of the marine hospital service, two in number, to be stationed at Quebec for the purpose of inspecting the disinfection and labeling the baggage and giving certificates to immigrants bound for the United States.

It was feared at one time that Halifax would be a point of danger during the present season. Halifax is the winter port of entry for Canada, and it was proposed to continue the landing of immigrants there through the summer, but the steamship agents were informed that the quarantine plant at Halifax is insufficient; and therefore immigrants arriving there and seeking entrance into the United States through Canada would be subjected at the border to every possible delay through inspection and disinfection by the United States officers, or perhaps be turned back into Canada. Assurances were thereupon given that no immigrants will be carried to Halifax.

Thus it would seem that protection against the introduction of cholera through Canada is as complete as it can be made.

With regard to the quarantine and maritime ports in the United States it will be remembered that the new law provided that an examination should be made of all State and local regulations, and if any were found insufficient, the secretary of the treasury should make additional ones. In accordance with this provision a request was sent to all quarantine authorities to transmit their rules and regulations to the marine hospital bureau. A general response followed, and after examination it was evident that to determine upon the sufficiency of all, a minimum standard must be established embodying what should be required of every quarantine station in the United States.

(*To be continued.*)

SOCIETY PROCEEDINGS.

American Surgical Association.

Buffalo, N. Y., May 30 to June 1, 1893.

(*Concluded from page 670, Vol. XXI.*)

Dr. Chas. B. Nancrede of Ann Arbor, thought that there was no danger of hemorrhage in the clamp and cautery method provided it was done properly, and the tissue not burnt off rapidly. He had never seen primary or secondary hemorrhage from it.

Dr. A. G. Gerster of New York, said that hemorrhage never occurred with the clamp and cautery method, provided the cautery was properly applied and not too much heat employed.

In the Whitehead or Lange operation profuse hemorrhage does not occur unless the incision is carried in too far. It should hug closely the inner margin of the sphincter, and the mucous membrane should be stripped off without the use of the knife. In the final transverse division of the mucous membrane a small portion only should be cut at a time, and this secured by suture before another portion is cut.

Dr. Roswell Park of Buffalo, exhibited anatomical specimens illustrating a method of preparation. Preparations of joints were shown made thirteen years ago, in which the joints were still movable, although they had been exposed to the air.

REPORT OF AN ATTEMPTED BLOODLESS OPERATION FOR MALIGNANT POLYPUS SPRINGING FROM THE BASE OF THE SKULL,

by Dr. Roswell Park of Buffalo.

The case was one of rapidly growing malignant tumor completely filling the pharynx, in which operation was attempted at the patient's request. In order to lessen danger from hemorrhage, he adopted the method suggested by Senn of isolating the trachea and passing a rubber tourniquet around the balance of the neck. While there was no arterial hemorrhage, there was excessive venous bleeding. The jaw was resected and the malignant material removed. During the operation respiration ceased and efforts at restoration were required for forty-five minutes before the operation could be completed. The patient left the table in apparently good condition, but died the next morning from shock, there having been no bleeding.

The following were elected as the officers for the ensuing year:

President, Dr. J. Ewing Mears of Philadelphia; first vice president, Dr. Roswell Park of Buffalo; second vice president, Dr. Lewis S. Pilcher of Brooklyn; secretary, Dr. J. R. Weist of Richmond, Ind.; treasurer, Dr. John B. Roberts of Philadelphia; recorder, Dr. De Forest Willard of Philadelphia; member of council, Dr. J. Collins Warren of Boston; chairman of committee of arrangements, Dr. L. M'Lane Tiffany, Baltimore.

The following were elected to membership:

Drs. H. S. Burrell of Boston; Perry H. Millard of St. Paul; Albert B. Miles of New Orleans; Samuel J. Mixter of Boston; John W. Elliott of Boston; John Parmenter of Buffalo; J. McF. Gaston of Atlanta.

To honorary membership: Prof. Carl Gussenbauer of Prague.

THURSDAY MORNING SESSION.

The first paper, read by Dr. J. William White of Philadelphia, was entitled

THE PRESENT POSITION OF THE SURGERY OF THE PROSTATE.

In regard to the nature of the prostatic enlargement it was held that the prostate gland was a part of the sexual apparatus and not chiefly an accessory organ of micturition, and that the growth or growths which make up the enlargement are analogous to the fibro-myomata so frequently found in the uterus.

The changes in the bladder are due to the mechanical obstruction, the circulatory disturbance produced by pressure on the prostatic veins and to septic infection.

The symptoms of prostatic enlargement were discussed at length. In regard to treatment, purely expectant treatment is proper only where the enlargement has produced no symptoms and catheterization is easy and shows no residual urine. Ergot is the only drug that offers any prospect of usefulness, but it is far from demonstrated that it has any destined effect. Palliative treatment consisting in the systematic use of steel sounds for dilatation and the employment of the catheter is of great value in a large number of cases.

The following operative measure discussed: Overstretching of the prostatic urethra. This is not likely to be followed by good results in cases where the median lobe and the vesical neck are chiefly involved. In lateral hypertrophy where the urethra is simply narrowed it may be of use; 2. Perineal prostatotomy should be regarded as that of choice in cases in which with marked diminution of the expulsive force, and with cystitis there are evidences of widespread degenerative disease or of distinct renal disease, toxæmia and general feebleness; 3. Perineal prostatectomy, where the growth can be reached by the finger and is of small size or pedunculated perineal prostatotomy can always be converted into a prostatectomy; 4. Supra-pubic prostatectomy is the operation to be preferred in those cases in which palliative treatment having failed there are unmistakable indications that the local conditions are worse, the general health remaining unaffected.

In conclusion, the speaker said that some time ago the thought occurred to him that possibly if the analogy between uterine fibro-myomata and prostatic growth was a real one, castration might have the same effect upon the

latter that oophorectomy does upon the former. At this time he had not read of the alleged prostatic hypertrophy in eunuchs, geldings, etc. He instituted a series of experiments on dogs to determine the effect of castration on the size of the prostate. It was found that the average weight of the prostate in dogs was 35.3 grams. The dogs were killed at varying intervals after the operation, the longest period being seventy-two days, and in all there was a marked diminution in the weight of the prostate, the gland varying in weight from 2.5 grams to 5.5 grams according to the weight of the animal and the period at which it was killed.

The author did not wish to be understood as advocating the measures which these studies would indicate. He simply presented the subject as a line of thought which had occupied his mind at odd times in order to have the criticism of the Association. As regards the employment of castration as a therapeutic measure in prostatic hypertrophy, the final answer must be left with the patient. If the time comes when we can promise equivalent results to those obtained by oophorectomy in uterine fibroids, there will probably be no lack of cases willing to submit to the operation.

Dr. Roswell Park of Buffalo, read a paper entitled

THE IMPORTANCE TO THE SURGEON OF THE BACILLUS COLI COMMUNIS.

The literature relating to the colon bacillus was thoroughly reviewed and evidence presented showing that this organism which is constantly present in the intestinal canal is not always a harmless inhabitant, but becomes at times an active invader, and does not confine itself to the intestinal mucosa where it may set up most active desquamative lesions, but may pass this barrier and penetrate into the general circulation and exercise pernicious activity in numerous other organs and toxic effects upon the system at large.

Herniary cholera so-called, is due to intoxication from the products furnished by the organisms in a virulent condition. From the intestinal canal the colon bacillus may ascend along the biliary passage determining lesions in the gall bladder or liver. It is known to be one of the frequent factors in peritonitis of intestinal origin. In the kidneys as well as in the bladder the colon bacillus may exert pathogenic and pyogenic properties. The organisms may be introduced from without as upon a catheter or may be transferred from their normal habitat by some traumatism of the natural channels. The endocardium, the meninges, the pleura, articular serous membranes and the lungs are at times not exempt from the manifestation of its activity. It is probable that there is a form of post operative septicæmia due in no direct way to the operator or operation but is in fact what it has often been called, an entero-sepsis, and due to the migration from the intestinal canal of the colon bacillus. Constant attention to the intestinal canal should therefore be the watchword of the surgeon both before and after operation.

The author reported six cases from his own practice in which the colon bacillus was found, and in some instances it was the only organism present. The cases were as follows: 1. Cancer of intestine with abscess; 2. Recurrent peri-appendical abscess; 3. Acute abscess of the liver; 4. Gangrenous appendicitis; 5. Acute appendicitis, with perforation and obstruction of the bowels; 6. Cholecystitis suppurative.

Dr. James M. Barton of Philadelphia, presented a paper entitled

WHEN SHALL WE REMOVE THE VERMIFORM APPENDIX?

Surgeons still differ on this subject, but they are probably removing the appendix less frequently than formerly. The author had been less fortunate in those cases where he had removed the appendix, so that now in those cases where there is a circumscribed abscess with no general peritonitis and no symptoms of intestinal obstruction, he does not search for or remove the appendix. In nine cases of abscess of the vermiform appendix operated on last year, and when the appendix was not removed, all recovered. In this class of cases portions of the appendix have already sloughed away and the opening into the bowel is firmly closed, and there is little danger of fecal matter making its exit through the appendix.

By not searching for the appendix, the time of operation is much lessened and the loss of blood is not so great. The drainage tube and gauze keep their places better when the walls of the abscess cavity are unbroken.

The two most fatal complications after operation are septic peritonitis and obstruction of the bowels. There is of course less danger of peritonitis if the adhesions are not broken down. When there is obstruction, if the obstructing portion of bowel can be identified, it should be liberated. If it can not be, after the abscess cavity has been disinfected, all adhesions should be separated. In this case the appendix should be removed. If there is no obstruction and the adhesions are separated, they may unite in such a way as to cause obstruction.

The following conclusions were presented:

1. An unruptured appendix, distended and discolored should be removed.

2. When rupture of the appendix into the general peritoneal cavity has occurred, the appendix should be removed and the abdomen flushed.

3. When a localized abscess that has existed for some days or weeks has ruptured into the general peritoneal cavity, the appendix should be removed and the abdomen flushed.

4. When adhesions to the abdominal wall have formed, open the abscess and drain, being careful not to break the adhesions that separate the abscess cavity from the general peritoneal cavity. The appendix should not be searched for nor removed.

5. When symptoms of obstruction are present empty the abscess, with the general peritoneal cavity well protected with gauze; disinfect the abscess cavity, then examine for the adhesion causing the obstruction, and if able to identify it, separate those adhesions only. If it can not be identified then separate all adhesions and remove the appendix.

When abscess has formed and there is no general peritonitis or symptoms of obstruction open the abdomen, protect the general peritoneal cavity with gauze. Then open the abscess and drain; do not search for nor remove the appendix.

The following papers were read by title:

Cystic Growth Within the Internal Condyle of the Femur, by Dr. Thomas G. Morton, and Dr. William Hunt.

Gun-shot Wounds of the Intestines. Report of thirteen cases, by Dr Albert D. Miles, New Orleans.

Dislocation and Injuries of the Semi-lunar Cartilages, by Dr. S. J. Mixter, Boston.

Report of Cases of Anthrax, by Dr. H. L. Burrell, Boston.

Lymphangitis Accompanied with Blood Poisoning and followed by Multiple Abscess, by Dr. J. M'Fadden Gaston, New Orleans.

Clinical and Medico-Legal Observations in Certain Forms of Spinal Injury, by Dr. Perry H. Millard, St. Paul.

A Series of Operations on the Elbow, by Dr. J. S. Wight, Brooklyn.

The Association then adjourned to meet in Washington the first Tuesday of May, 1894.

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SATURDAY, JULY 1, 1893.

INSTRUCTION IN PSYCHIATRY IN AMERICAN MEDICAL COLLEGES.

At the recent meeting of the Medico-Psychological Association in this city a paper was read on the subject of psychological instruction in American medical colleges. The writer followed the statistical method and as a result of his inquiries he reported that between sixty and seventy medical colleges now possessed chairs on psychiatry or mental diseases in some form or another and that this showed a large increase over any former figures.

The value of psychiatrical instruction could not, of course, be estimated by this method. The reports received by the writer of the paper were naturally from all schools of medicine, and doubtless included some of the worst or poorest as well as some of the best institutions. One thing, however, may be accepted as a fact—that is, however gratifying the recognition of the fact that some instruction in this regard is or should be a necessary part of any medical education, the opportunities for affording this instruction in any adequate manner are far from being equal in the different localities. Mere oral instruction by lecturers has only a little advantage over the reading of text books, and clinical faculties are not everywhere available and when they are to be had are too seldom properly utilized. From the necessities of the case asylums are commonly located inconveniently for clinics and an occasional walk through their wards affords only a very imperfect notion of the realities of mental disease. Students are not likely in any large numbers, to make expensive excursions into the country at such frequent intervals as would be required to furnish them with any correct notions of insanity from actual clinical experience. Asylums or hospitals for the insane do not moreover promise attractive internships, certainly not as compared with the advantages of such positions in general hospitals. It is only when the institutions for the insane are located in the great medical centers or are in their immediate vicinity so as to be readily accessible without too great expense of time or money, that they can be profitably utilized for clinical instruction. When all these conditions are met it too often happens that owing to unenlightened public opinion and indifference or hostility of officials they are altogether unavailable for the purpose. It would be easy to count on one's fingers the localities where proper clinical instruction is possible and it would be hard, we venture to say, to name half a dozen of these where all the advantages are fully utilized. The condition of affairs is not, therefore, one that justifies any too much complacency.

One point that seemed to give satisfaction to the reporter on the subject was the increasing number of superintendents filling these chairs. This ought to be an encouraging feature of the case, but in view of the methods of appointing these officials in some parts of the country our satisfaction must here also be a somewhat qualified one.

There is no place in the country where better opportunities for clinical instruction in mental disease are afforded than in the detention hospital in Chicago, were it in the hands of a properly qualified and skilled clinician who could act as chief of clinic, and who could direct the institution. The patients could be utilized with all due regard to their sensibilities and those of their friends and there should be no more difficulty than there is in conducting the clinics of the general hospital to which it is attached. At the present it is largely a wasted opportunity.

It may be some consolation to believe that the advantages for clinical instruction in psychiatry are limited in the same way in other countries. This, however, ought not to induce any undue satisfaction over the condition of things here.

CONSTITUTIONALITY OF GIVING EXAMINERS SUPERVISION OVER MEDICAL COLLEGES.

In Iowa there is a statute, as in many another State requiring that every person practicing medicine, surgery, or obstetrics within the State, shall first procure a certificate from the board of medical examiners of his right to do so; and, which, after providing that graduates in medicine desiring such certificates shall present his or her diploma to the State board of examiners for verification as to its genuineness, provides as follows: If the diploma is found genuine, and is issued by a medical school legally organized and in good standing, of which the State board of examiners shall determine, and if the person presenting and claiming such diploma be the person to whom the same was originally granted, then, the State board of examiners shall issue its certificate to that effect, signed by not less than five

physicians thereof, representing one or more physicians of the schools on the board, and such certificate shall be conclusive as to the right of the lawful holder to practice medicine, surgery and obstetrics within the State. This was claimed to be in violation of a provision of the constitution that all laws of a general nature shall have a uniform operation; and the general assembly of the State shall not grant to any citizen or class of citizens, privileges or immunities which, upon the same terms, shall not equally belong to all citizens; and, providing further, that no corporation shall be created by special laws, but the general assembly shall provide by general laws for the organization of all corporations to be created. But these laws are general and uniform, not because they operate upon every person in the State, for they do not, but because every person who is brought within the relation and circumstances provided for, is affected by the law. They are general and uniform in their operation upon all persons in the like situation, and the fact of their being general and uniform is not affected by the number of persons within the scope of their operation. The statute under consideration is clearly within this rule "because every person who is brought within the relations and circumstances provided for is affected by the law." It is uniform in its operation "upon all persons in the like situation," and grants no privileges or immunities that do not equally belong to all citizens. So holds the Supreme Court of Iowa in the case of the Iowa Eclectic Medical College Association v. Schrader, (55 N. W. Rep. 24). The State board is not a corporate body, but a branch of the government. The authority to refuse certificates to graduates of medical schools not in good standing does not extend special privileges or immunities to other schools that are determined to be in good standing. True, no appeal has been provided for, but the students of a school which has not been determined to be in good standing, in common with all other persons, have the right to go before the board and be examined, without regard to diploma, and, if found to have the requisite qualifications to receive a certificate. The board acts under the restraints of law that require proper inquiry into the matters to be determined, and it may not be presumed that the board will act arbitrarily and without investigation. The board can not arbitrarily determine whether a school is in good standing. If it does, its action is illegal. Consequently after the board has recognized a school as in good standing, it can not afterwards refuse to issue certificates to a graduate of such school until its standing shall have been re-determined. Neither is it legal for it, when charges are preferred against a recognized college, by a stranger, in May, to refuse it recognition and adjourn until November, leaving it in doubt in the mind of the public whether or not the school and its graduates are in good standing. Such action is illegal as reversing a former action of the board without any investigation and without sufficient cause. This is not to say that the board is concluded, by having once determined that a school is in good standing, from thereafter determining differently, but only that it has no power to do so arbitrarily and without investigation. Nor is it to say that such inquiries must be attended with the formality of a trial in court, but the determination must be based upon inquiry and facts, and not upon the mere arbitrary will of the board. The standing of a school, as contemplated in the statute, is rather what the school is, in respect to the thoroughness of its course, then what it may be reputed to be. The board is fully authorized to determine, upon proper investigation, that a school is not in good standing that does not meet the minimum requirements as to extent and thoroughness of its course. While the graduation of an unusual per cent. may be ground for closer scrutiny, it may well be questioned whether the board may arbitrarily say that but forty-five per cent. shall be permitted to graduate. Much was said in argument about the composition of the board as to the different schools of medicine, but as the statute does not require that the different schools shall be represented on the board its composition can not affect its jurisdiction, or the legality of its acts in the respect under consideration.

THE DECREASING BIRTH RATE.

DR. J. S. BILLINGS contributes to the June issue of the *Forum* a brief but suggestive article on the decrease of the birth rate in the United States, as shown by the figures of the recent census. The subject is not entirely a new one, but its treatment by so high a medical authority in an article for popular information merits notice. It will probably call some general attention to the subject, and it is well that it has been handled by one who can give a fair statement of the facts with judicious scientific deductions from the same, instead of by a popularizer whose main idea might be to produce a sensational and alarmist article. DR. BILLINGS, while he sees certain evil tendencies in the causes of this decreased birth rate, does not make them the sole text of his paper, nor does he consider the falling off in the number of births as necessarily an unmixed evil. Even were it altogether an evil, the comparative statistics do not show that this country as a whole is worse off than most other highly civilized nations, and they do show that its birth rate is decidedly above that of some portions of western Europe.

The causes of a decreasing birth rate are very numerous, and some of them are undoubtedly such as can not rightly receive medical commendation or

countenance. The underlying cause, however, as any one may see, is the increasing difficulty of the struggle for existence, and the ratio of births to the population may be taken as one of the principal indices of the intensity of this struggle. Of course, the greater the number of wants the sooner will this difficulty be felt, hence the ratio of births will decline sooner amongst the educated and cultured than in what may be called the lower classes, whose needs are fewer and whose ideals of life are less refined and luxurious. Perhaps, also, physical causes may come in play here; the relations of the sense of hunger to the generic appetite, and the fact that overfeeding reduces fecundity even in the lower animals, are suggestive in this connection. The spread of education and of habits of comfortable if not of luxurious living are therefore enough in themselves to largely account for the facts in this regard, as we find them.

The fact that the greatest decrease in the birth rate seems to have occurred in the regions where the colored race is most numerous seems a little anomalous to DR. BILLINGS, and he is inclined to account for it, in part at least, by imperfections in the statistics. These may have existed either in the figures of the late census or that of 1880; in either case the apparent increase might be partially thus accounted for, but it seems not unlikely that the great changes in the conditions in the southern States within the past two or three decades are now having a more decided effect than ever before, and affecting the colored race as much or perhaps even more than the white.

A noteworthy fact pointed out by DR. BILLINGS is that the present conditions as to population were predicted as long ago as 1843 with a very close approximation to absolute accuracy. Looking to the future a still further decrease in the birth rate may be reasonably expected before population, with its present tendencies, reaches what we may call its regemen or equilibrium. Under present conditions, with the increased knowledge and success of sanitation, the infrequency of wars and general pacific tendency of our civilization, and the gradual filling up of all lands suitable for civilized habitation, a decreasing birth rate would seem to be almost the only protection against the realization of the worst anticipations of the Malthusians. While this is true of the United States, it applies still more forcibly to the overpopulated sections of western Europe, which can not very much longer relieve themselves by sending their surplus population to this country.

PIT BURIALS IN LONDON.

Some curious testimony has been recently brought out incidentally in an inquiry by a committee of the British House of Commons in regard to the certification of deaths in England. It seems to be the custom in some of the cemeteries around London to make large graves or pits which are kept open for days and weeks to receive bodies which are piled one upon another till the coffins are often crushed by the superincumbent weight. One of these pits for example, was kept open for forty days from June 6, 1892, according to one of the witnesses, who mentioned also other instances. The chinks between the adult coffins were filled in with those of children and there seems to have been nothing to prevent surreptitious abstraction or insertion of bodies had any one been so inclined. Identification was apparently totally disregarded.

The medico-legal and sanitary objections to such a condition of affairs are sufficiently obvious, and it is surprising that it has been so long permitted to exist in a civilized country like England when sanitary authorities are supposed to have full sway and law is so prëeminent. As the *British Medical Journal* says, very justly, it is a satire on their civilization.

DOMESTIC CORRESPONDENCE.

The Present Status of the Medical Profession.

To the Editor of the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION:

Dear Sir:—An article on this subject by Dr. Dudley S. Reynolds, in the June 3 issue of THE JOURNAL, reminds me of the case of a real estate friend of mine who has invested largely in acreage near our city, the demand for which has never been very brisk. Notwithstanding that he has been unable to unload, my optimistic friend periodically takes stock of his investment and adds a good round percentage to his estimate of its value. This he has been doing for a number of years and, as a matter of consequence his books show him to be a very wealthy man, while as a matter of fact he would have difficulty in realizing the original purchase price of the property.

Dr. Reynolds' article shows the present status of medical education and the requirements for graduation to be eminently satisfactory and pregnant with hope. Unfortunately, however, his article is based on nothing more substantial than the copies of College Announcements in his possession. While his paper showing has, therefore, so much of the color of the rose the question recurs whether the rock bottom facts warrant his conclusions. I venture the opinion (an opinion, moreover, which is not merely an opinion) that they do not. The announcements of our colleges are far from being guarantees that the requirements as therein published are faithfully lived up to. I am, for instance, cognizant of the case of a young man who, without previous attendance at lectures in any other medical school was graduated at the end of a single session from an institution which advertises a requirement of attendance on three six months' courses. Again, let me give you a few extracts, *verbatim et literatim et punctuatim*, from papers submitted by students who were graduated from a so-called medical college in good standing in the Association of American Medical Colleges, and whose announcement would lead you to believe that it is devoted to the cause of the higher medical education:

"Inflamatory rumatism is lactic acid in the blood it is complicated some times with gonerhea and inflamations

and sevear colds. Increas of blood to the part acumilation of white corpucles to the part braking down into puss pain heat rise of temperature swelling pain on bending the part or on pressure readress swelling emation. Treatment give salcilate soda salciac acid apply oil of wintergreen over the parts give rest to the parts and apply hot or cold applications."

Treatment of eclampsia: "To keep the patiant from stricking his head or limbs against and place the patiant in a horzontal position to favor respration circulation. Give bromide of potass. to act as a direct sedative or to excite motor suseptibility of the medula oblongata of the nerve centeres and keep perfect qeuiet."

"Cholor infantum is due to a tomen symtom comences with Diarrhea first stools partly soft yet Liquid and stains the clothing a green color with a musty Odor vomiting pain and Rise of temperature and rapid prostration. May efect the brain when the patiant Roles heat and sleep with eyes open give Bromide potass for this first give Hyd chlor mit in small doses every hour and epecac at first and then Bismuth and Shlicylyc acid give stimulent to keep up the strenth."

"In false croup the farinx is not involved there is false membrane we dont get the spasms."

"There are 3 Verietys of pnemonia lobor Lobular interstiscial lobor is where we have all the lobes of the lung involved we have 3 stages. The inflamation extends from below upwards the seat of inflamation is in the alveoli or air vescle. Stage of ingorgement last 24 to 70 days red hepatization 5 days."

"The Teory of diebetis is an eretation upon the floor of the 4th ventrecle, may be do to Violence or High liveing."

The only hope for improvement in medical education lies in the divorce of the licensing from the teaching power. While there are many well equipped medical schools, and many honest medical schools, which endeavor with their limited facilities to do honest work, it is a notorious fact that in very many others there is no attempt at imparting the "laboratory instruction in chemistry, toxicology, urinalysis, normal and pathological histology, bacteriology, pathology, and hygiene" which Dr. Reynolds tells us "nearly every medical college in the United States now requires."

The fact that students are graduated on the strength of papers from which I have given the above extracts, is its own commentatory but when (oh tell it not in Gath) such students are immediately after graduation appointed to positions as teachers in their *alma mater* (Heaven save the mark!) is it not high time that something more were done for the cause of medical education than the writing of gratulatory papers founded on rose colored announcements?

I am pleased to observe that the Illinois State board of health has, since my presentation to it of certain facts, refused to license the graduates of one institution on the strength of the diploma of that institution.

J. J. MULHERON, M.D.

Detroit, June 15, 1893.

Altitude Per Se.

To the Editor of THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION:

The relative importance of different climatic attributes in the cure of phthisis is one of the most difficult problems in climatology to solve.

The arduousness of the task is not lessened because the inquirer is an invalid himself seeking the total elimination of his tubercular bacilli. The liability of his being unduly influenced by his own experiences and environment is too great. Nevertheless it has to be acknowledged that much of the good work which has been done in climatology has been actuated by the intense interest of personal need. I am reminded that in our own country this field has been covered by such men as Solby, Fisk, Anderson, Keating, Tindale, Loomis and Gleitzman, whom I happen to know were one time invalids. Nor would I wish to dodge the applicability of the criticism to my own writings simply because I waited three years after starting out as a health seeker, before announcing my conclusions to the Centennial medical congress in 1876. I refer to the argument presented and afterward embodied in a brochure, "The Preferable Climate for Consumption," which the legislature of Colorado did me the honor to order printed for public distribution. This treatise has never received so thorough and withal so complimentary an overhauling, as appeared in the issue of THE JOURNAL of June 10, by Dr. Boyd Cornick of Knickerbocker, Texas.

While I have to question the proving in this well written article, of any point against rarefaction of the air as an important factor in "the preferable climate," yet I wish to express my great pleasure for the important position in this controversy accorded my work. It is not otherwise than gratifying to me to be charged with so much of the molding of the medical opinion as to the best make up of climate for combating pulmonary consumption. There are indeed, only a very few points in Dr. Cornick's article I would wish to correct.

Except for taking your valuable space with my personal views, I would *in extenso* remind the doctor and his readers—1. That he reasons from his own peculiar experience commencing, as I understand it, last October, and that the approaching hot weather in Texas may enforce, even in his own case, a better appreciation of the "coolness or cold" which will be found as summer comes on in the elevated regions northwest of his locality. 2. That the argument in favor of the mechanical influence upon contracting and diseased processes in affected lung areas (which effect must be attributed to rarefaction of the air or elevation above sea level) is not given due consideration in his paper. It appears that one would need no better proof of some positive effect than the doctor's statement of his own case. How, having gotten along so nicely in elevated southern New Mexico, (after a breaking down of one apex had occurred in the east; fever gone and expectoration ceased) he took cold and probably (?) had some fresh inflammatory process around or near his apical cavity, the cough or irritation due to which subsided on his going down to a lower elevation.

Very well; like the pleurisies which, under similar circumstances, or due to over exertion, are relieved by rest, counter-irritation and strapping the affected side with belladonna or rubber adhesive plasters, he may also have had an acute condition which demanded the temporary suspension of exercise or high altitude treatment, which are very much alike in their effects upon actively tubercular areas of lung tissue. Considering the elements of *time* and the need of the *classification of cases*, this instance should be looked upon as exceptional, and not the rule for invalids generally. 3. The conclusion drawn from the extreme humidity of that extremest of elevated observation points—Pike's Peak—must be ruled "out of court." It is not "in it" at all. People do not and should not try to live there, least of all a pulmonary invalid. That the Pike's Peak station goes on my climatic charts of the United States in the blue shade of extreme moisture is rather a proof of the faithfulness of that climatic delineation, and is thus explained: Any equable association of moisture statistics, as relative and absolute humidity and cloudiness, to determine the relative moisture of the air will be over balanced at that high station by the high relative humidity of the

air there, because Pike's Peak is so much in or above the clouds, and yet so cold that a very little absolute humidity *relatively* goes a great ways.

Let us keep *down* where the experiences of invalids are, and then try to compare these experiences with the attributes preferable for consumptives. Then *rarefaction* will, as it should, rank up in the scale along with *dryness, coolness, sunshine* and, important because necessary, *variability*. 4. I must hold firmly to my views as to the importance of increased aqueous transudation of vapor from the lungs due to rarefaction and cold, notwithstanding this criticism because, chiefly, Dr. Cornick does not take into consideration in his above calculation, the greatly increased *amount* of air which has to be breathed due to the element of rarefaction. It should be borne in mind that the necessity to breathe more air brings correspondingly increased lung action, and this brings with it increased heart action. The aspiration of blood from the right heart to the lungs and the propulsion of pulmonary blood on to the left heart, are both augmented. These internal effects, together with the lessened pressure on the periphery of the body increase capillary action everywhere, and much desired elimination is thus produced, enhancing the remedial effect of exercise and almost every other useful agent, at elevations from three to eight thousand feet above sea level. 5. It only remains for me to explain the seeming severity of my "*contra indications* to an otherwise preferable high altitude climate."

Individually I would myself, and I would expect others to, take these contra indications with a considerable "grain of salt." One does not like to, and can not lightly, assume the responsibility of the risk the invalid assumes in utilizing so positive an agency for good or for evil to affected lung tissue, as is a decided rarefaction of the atmosphere.

If the *diagnosis* which is the basis of any change to be made could always be assumed to be accurate and fully comprehensive, there would be, I think, a considerable leeway for modifying any contra indications.

CHARLES DENISON, M.D.

Lake Geneva, Wis., June 12, 1893. Denver, Col.

BOOK REVIEWS.

A DICTIONARY OF PSYCHOLOGICAL MEDICINE. Giving the definition, etymology and synonyms of the terms used in medical psychology with the symptoms, treatment and pathology of insanity. Edited by D. Hack Tuke, M.D., LL.D. Philadelphia: P. Blakiston Son & Co. 1892.

It is indicative of the rapid advance of psychological medicine that a special dictionary should be issued, containing 1,477 octavo pages devoted exclusively to a definition of its terms.

Taking the work as a whole it is apparent that the editor and his assistants have performed their tasks exceedingly well. While minor defects can be pointed out yet they are so insignificant when compared with the general value of the work that they scarcely deserve mention.

One hundred and twenty-eight authors including some of the ablest living writers on psychology have contributed to its pages. Among these names we note those of Allbutt, Ball, Beeror, Benedikt, Bernheim, Blocq, Brunton, Buzzard, Charcot, Clouston, Erlenmeyer, Horsley, Lewis, Mendel, Norman, Page, Pontoppidan, Ribot, Savage, Sully, Tamburrini and Yellowless. It was but natural that the bulk of the contributors should be drawn from the English and Scotch writers, though there is a liberal admixture of French and German. Americans have on the contrary been almost wholly ignored, but five contributing to its pages of whom only two, Donaldson and Earle are fairly well known to readers of American medical literature. We can not but regard this omission as significant, especially when America presents such an able record in psychological research.

The work opens with an historical sketch of the insane by the editor and one on the philosophy of the mind by W. E. Coupland and then passes to special definitions. This, the main part of the work has been well done, and reflects credit upon the editor, who has certainly performed no mean task in coördinating the work of so many writers. The work is not only a dictionary but an encylopedia as well. Some terms receive but a line while other definitions are expanded into pages. Thus "alogus" receives two lines while alcoholism takes up sixteen pages. If space were not too limited it would be interesting to consider some of the more lengthy articles, but the views of most of the writers are already well known, and in the sense of the work advancing our knowledge it contains nothing worthy of comment. As an index of what is already known, and as a guide and help to the students of psychiatry it will prove invaluable.

MINERAL SPRINGS AND HEALTH RESORTS OF CALIFORNIA. With a complete chemical analysis of every important mineral water in the world. Illustrated. A prize essay; annual prize of the medical society of the State of California, awarded April 20, 1889. By WINSLOW ANDERSON, M.D., M.R.C. P., Lond., M.R.C.S. Eng., etc., joint editor and publisher of the *Pacific Medical Journal*, teacher of chemistry and materia medica in the University of California, etc. San Francisco: The Bancroft Co. 1892. Pp. 384.

Dr. Anderson has produced a book that should command the thanks not only of California, but of all medical practitioners. The profession and people of his State are under especial obligations to him for his patriotic services, and any physician who desires to profit by a personal or professional acquaintance with hydrotherapy can not read this book without appreciating the large amount of research and analytical labor involved in its compilation.

However, it is more than a compilation. For several years the author has been investigating and analyzing the mineral springs of California, and comparing them with those of the eastern States and Europe. The comparisons result favorably to the home springs, so far as all the natural advantages are concerned. He concludes that nothing more is needed, to make them as beneficial as the better known water cures, than their further development and scientific use.

There are alphabetical lists of most of the well known springs of Europe and America. There are 200 analyses of the mineral waters of America and other countries, besides about 100 analyses among 200 springs of California. The various springs are classified, and the therapeutics of the different kinds are given.

The climatic, scenic and domestic advantages of the California health resorts are dwelt upon in a very attractive, not to say fascinating way. Indeed, the descriptions and the many charming illustrations that adorn these pages are enough to create a strong desire to visit this golden garden of the gods.

While the author sensibly deprecates the commercial cant of those resort promoters who claim cure-all properties for their springs, he lucidly places the various waters in their rightful relations to health and disease. He points out the ailments that will be benefited or injured by certain mineral waters, and how the uses and abuses of the baths result.

With the natural advantages of climate, proximity and economy of these water resorts, it is difficult to understand the American fad of visiting such springs as Carlsbad, where one witnesses every morning the depressing, death-suggesting pageant of the marching miseries of all nations

in funeral procession abut the springs, accompanied by the fantastic strains of the Straus waltzes. The scene is grotesque to the spectator who glories in good health, but the writer felt when looking on this picture that it was the last place on earth to choose as a stepping stone to health and good cheer.

An infinite contrast to this melancholy spectacle is presented by the quiet and isolated health resorts of our own luxurious king State of the Golden Gate. Here the sufferer has for his companions, not wasting disease and waiters upon death, but the refreshing songs of the birds and brooks, the health-inspiring looks of the gatherers of fruits and the miners of precious metals, the most lavish growths of plants and trees, the most luscious of fruits, the most gorgeous of flowers, the most invigorating air, the sublimity of mountain scene and ocean expanse, and the most hospitable inhabitants of the globe.

TRANSACTIONS OF THE FOURTEENTH ANNUAL MEETING OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION, held in the City of Boston, June, 1892. New York: D. Appleton and Co. 1893. Pp. 120.

Nineteen of the forty-five active members were present at this meeting, and nineteen papers were read.

The volume opens with an address by the president of the society, Dr. S. W. Langmaid, outlining its history and work briefly, and proposing an increase in its membership.

Dr. D. B. Delavan presented a paper on "The Influence of certain Diathetic Conditions upon the Prognosis in Operations upon the Throat," in which he concludes that: "1. Rigid examination as to the possible existence of the hemorrhagic diathesis should be made prior to operation in every case. 2. In the existence of hemophilia, operation by any procedure at present known is absolutely contra indicated. 3. Since many of these cases urgently require relief, it is most desirable that a method reaching them more satisfactorily than any heretofore practiced be suggested." However, according to the observations of Dr. J. L. Watkins, this condition is due to the deficiency of calcium salts in the blood, especially of chloride of calcium, and the administration of these salts will cause the blood to coagulate.

Dr. S. H. Chapman related some unusual pathological conditions of the upper air passages coincident with attacks of the grip. One of these was the formation of a false membrane, not diphtheritic, in the larynx. The discussion on his paper brought out other like cases.

The paper that seemed to arouse the most interest and debate was on the use of sprays, by Dr. C. C. Rice. The types make him refer to lanolin as a petroleum product, although it is a solid fat obtained from sheep's wool. It is probable that he wrote lavoline, which is a liquid like albolene. The writer has seen this change made by printers a great many times, and persistently, even after corrections of proof. There are some of the most surprising statements in this paper and the discussion following it. The author deserves credit for advising against the use of the nasal douche. He prefers the oily to the watery solutions. While he warns against employing too much pressure with these sprays, he uses from fifteen pounds for the anterior nares to thirty pounds for the larynx, which is about 30 per cent. more pressure than is necessary with the most improved spray producers. He insists that the sprays should be warmed before using; why not insist that the air we breathe should be warmed? In this paper and discussion will be found a number of examples of the crotchets of our specialists. Dr. Rice emphasizes one excellent practice; that of having patients assist in their own treatment by keeping the naso-pharyngeal passages cleansed and disinfected by the use of hand atomizers at their homes.

Dr. Bosworth criticised this paper in a very caustic manner, condemning sprays of every kind. He says: "There is no such disease as catarrh, and supersecretion is a condition which we seldom have to meet. In a vast majority of cases deficient secretion exists. I except from this statement naso-pharyngitis, and really know but little about naso-pharyngitis." He unhesitatingly places the nasal douche in the hands of his patients. He says of hypertrophic rhinitis: "We do not cure these cases; the patients cure them for us." While the essayist lauds cocaine for its astringent action, Dr. Bosworth says: "It is not astringent; it does not constrict the secreting apparatus." He has abandoned it, together with his compressed air apparatus.

Dr. Wright discredits oily sprays.

Dr. Asch, speaking of the nasal douche says: "Accidents do occur and patients never forgive."

Dr. Mackenzie and others bombarded the position of Dr. Bosworth with some pretty luminous pyrotechnics. In fact, the discussion of this paper alone is worth the price of the book. It is a treat.

Dr. C. E. Bean reports three cases of that very rare and distressing affection, nasal hydrorrhœa. Two were associated with asthma and the third with hay fever. No satisfactory treatment has been found.

Another very interesting discussion is found at the end of Dr. De Blois' paper on the "After Results of Nasal Cauterization." The discussion is twice as long as the paper, and some of the discussions are even more valuable than the papers themselves.

MISCELLANY.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.—The third annual meeting of the American Electro-Therapeutic Association will be held in Chicago, September 12, 13 and 14, at Apollo Hall, Central Music Hall Block. Members of the medical profession interested in electro-therapeutics are cordially invited to attend.

AUGUSTIN H. GOELET, M.D., *President.*
MARGARET A. CLEAVES, M.D., *Secretary.*

OFFICIAL LIST OF CHANGES in the Stations and Duties of Officers serving in the Medical Department, U. S. Army, from June 17, 1893, to June 23, 1893.

Capt. Charles E. Woodruff, Asst. Surgeon, is granted leave of absence for one month and twelve days, from August 1, 1893.

First Lieut. Harry M. Hallock, Asst. Surgeon, will on July 6, 1893, proceed to Griffin, Ga., and report to Capt. George G. Greenough, Fourth Artillery, for duty in connection with the encampment of State troops at that place.

First Lieut. J. D. Glennan, Asst. Surgeon (now at Ft. McIntosh, Tex.), will report to the commanding officer, Third Cavalry, to accompany Troop I of the regiment to Ft. Sill, O. T.

Capt. Daniel M. Appel, Asst. Surgeon, is relieved from further duty as attending surgeon for the officers and enlisted men on duty at the World's Columbian Exposition, and will report to the commanding general, Dept. of the Missouri, Chicago, Ill., for duty as attending surgeon and examiner of recruits in that city.

Capt. A. R. Chapin, Asst. Surgeon U. S. A., is granted leave of absence for one month.

OFFICIAL LIST OF CHANGES in the Medical Corps of the U. S. Navy, for the Week ending June 24, 1893.

P. A. Surgeon D. M. Guiteras, from Naval Hospital, Philadelphia, and to Naval Laboratory, Brooklyn, N. Y.

Asst. Surgeon R. M. Kennedy, from coast survey Str. "Bache," and to examination for promotion.

P. A. Surgeon George H. Barber, from the U. S. S. "Miantonomoh," and to the coast survey.